WWW traffic performance in wireless environment

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Tiivistelm — Referat — Abstract

In this thesis we present a performance analysis of HTTP traffic which runs on TCP protocol over a high-latency GPRS / UMTS type wireless link capable of retransmitting lost frames. The link level retransmission causes additional variable delays, which may cause spurious retransmission timeouts resulting in multiple unnecessary retransmissions of TCP packets. If the link level retransmission fails TCP packets may be lost. Due to the limited buffer space at the last-hop router the TCP transfers may experience also congestion related packet losses. In our tests we concentrate on HTTP 1.0 type traffic with typical workloads used in WWW today. The wireless link and the last-hop router are modeled with a real-time software emulator, which allows the use of a real protocol stack and gives the control over link characteristics. We compare the performance of a selected baseline TCP and various TCP enhancements using four types of links including optimal link and links capable of retransmitting lost frames maximum of one, two and three times. TCP enhancements compared to the baseline TCP are Increased Initial Window, TCP Timestamps, D-SACK and F-RTO. A detailed analysis is presented to explain the drawbacks and benefits of each enhancement and link configuration with different workloads. The test results indicate that especially the use of Increased Initial Window improves the performance of TCP with our workload. In the test cases that have spurious retransmission timeouts F-RTO and TCP Timestamps improve the TCP performance. D-SACK does not improve the performance of TCP in most of our tests.

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Contents

1 Introduction

Fixed networks of today are not prone to data corruption. If a packet is lost, it is normally due to congestion, not for data corruption. Wireless networks have typically a very high bit error rate compared to fixed networks, which causes error related packet losses in those environments. Transmission Control Protocol (TCP) [Pos81] has been developed to perform well in fixed networks. TCP uses a congestion avoidance algorithm to probe the capacity of the network and if a packet is lost, it reduces the transmission speed. This reduces the performance in environments, where packet drops are not for congestion. In wireless networks which are capable of doing link level retransmission of lost frames, long variable delays exists. The delays may cause spurious retransmission timeouts in TCP, which are often followed by multiple unnecessary retransmissions of TCP packets causing remarkable decrease in performance. A number of TCP enhancements that try to ameliorate the performance of TCP in cases of sudden delays, lost retransmission, burst losses and packet reordering compared to the conventional TCP have been introduced.

WWW traffic which is based on Hyper Text Transfer Protocol (HTTP) [Ber96] runs over a TCP implementation, and is therefore prone to the same drawbacks as the TCP protocol. HTTP 1.0 is a simple request-response protocol in which each request results in a new TCP connection. Due to the congestion control algorithms, each new TCP connection begins in a slow-start period. In wireless environments latencies are noticeable, which makes the HTTP typically inefficient. HTTP 1.0 supports, however, a number of simultaneous connections.

In this thesis we analyze the performance of HTTP traffic which runs on TCP protocol in GPRS [ETS98] / UMTS type wireless network. The tests are run on Linux operating system, whose TCP implementation has many new features suggested by the IETF. We have chosen a state-of-art TCP as a baseline, and compare its performance to TCP variants that include some additional enhancements.

In the experiments the HTTP traffic is generated using an HTTP traffic generator, which emulates customizable web requests. The requests are transmitted over a wireless link, which is modeled with Seawind network emulator [Koj01]. The emulator gives us a rich set of ways to define transfer characteristics to match different network conditions including delays and errors, and to conduct large sets of experiments in an automatic fashion. The Seawind wireless network emulator allows use of a real protocol stack on end hosts and thus no TCP emulation is needed. The Seawind software has also tools which help us to analyze the measurements. A number of preliminary tests are first run to fine-tune the network and link parameters. After running the tests we analyze the results,

and discuss the reasons behind the observed behavior.

The target network environment for this study is described in section 2. In section 3 we describe the properties of Transmission Control Protocol in general and expected behavior in wireless environment. In addition, we describe some differences between the Linux TCP implementation and IETF specifications. Section 4 defines the traffic model, that will be used in the tests of this thesis. The model is based on measurements in other related works and on other data available. We also discuss the features of the HTTP protocol versions and their effects in TCP during transmissions.

In section 5 we first define what is exactly measured and how the tests are arranged. This includes discussing the objectives of the tests and methods that are used to run the tests and specifying how the test environment is modeled. Additionally we define the workload and TCP enhancements used in the tests and the metrics that are used in evaluating the results. In addition to the test arrangements, we discuss the validity and the coverage of our experiments. The results are analyzed in section 6. Finally in section 7 we conclude our work.

2 Environment

In this section we describe the characteristics of the target communication environment used in this thesis. Figure 1 illustrates the network environment.

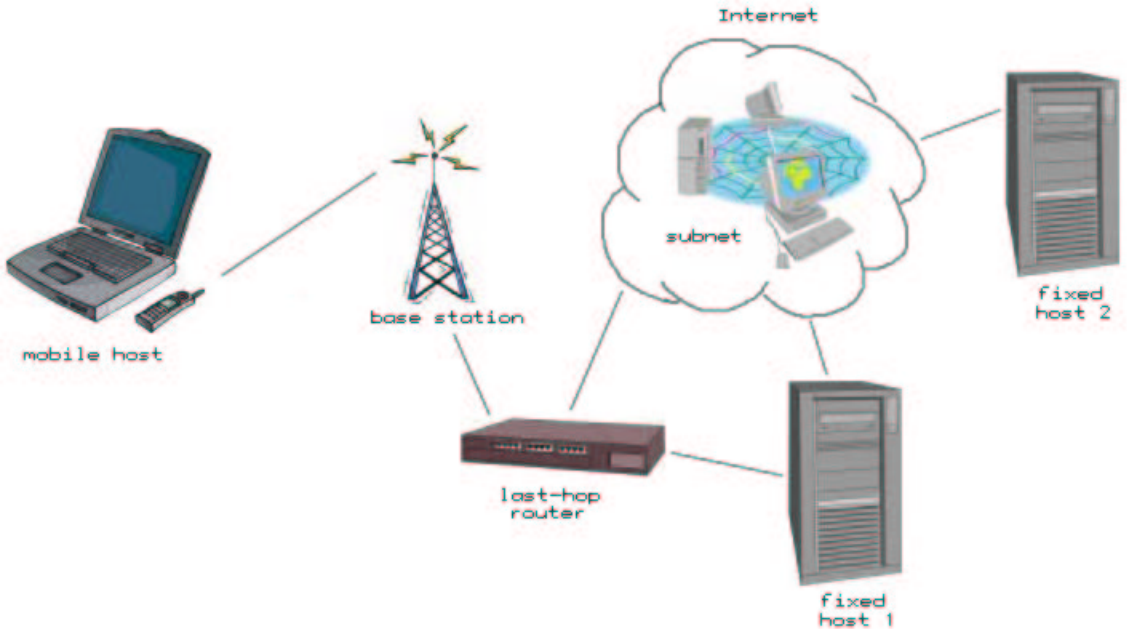

Figure 1: The architecture of the network

The network is divided in two fractions which differ greatly from each other. The first part is the fixed network ending to a last-hop router. The fixed network may be an inter network of any size. The second part is the wireless network providing a logical link between the last-hop router and the communicating wireless device. Due to the nature of the GPRS type networks, the *base station* may change when the mobile host travels to a different place. This may cause additional delay, but the TCP transfer from the TCP sender to the TCP receiver is done using one base station at a time. Therefore we have only one base station in figure 1. Fixed and wireless networks are next described in more detail.

2.1 Fixed network

Fixed networks are the most common types of networks that exist in the Internet today. They build up from small local area networks (LANs) which are connected to each other with routers and base links. Fixed networks are typically very fast and reliable comparing to wireless networks. Data corruption in fixed networks is rare and seldom the source

of packet drops. They are however very heterogeneous: the links between different hosts may be very different in speed, latency and other characteristics. The hosts themselves differ greatly from each other, which results in different delays when processing requests.

Although no packets are lost for data corruption in general, the different speed and usage of links may cause congestion in certain parts of a network. If more packets are received by a router that can be sent, the buffers fill up and packets have to be dropped. This problem is well explored and a number of articles offer enhancements for it in the TCP protocol level [All99a][Bra98].

Architecture in inter networks of today is highly based on server-client model. Therefore there is typically far more traffic from servers to clients than vice versa. In a large network, there may be any number of paths from a server to a client, and any of them may become congested. The path from a server to a host may also change between requests. Therefore estimating round trip times is not easy. A popular approach in HTTP traffic is to add a proxy server in the local network. A simple internet proxy server located in the same local area network with last-hop router can speedup look ups dramatically and make estimates of response times far more accurate.

In this thesis we assume the fixed network to be significantly faster than the wireless link. The error rate is low and packet drops mainly occur due to congestion. The last-hop router has limited amount of buffer space. While the traffic is mainly from the fixed network to a wireless device, the buffers are likely to overflow.

2.2 Wireless link

The second part of the communication environment is the wireless link between the mobile host and the last-hop router. In this thesis we focus on Wireless Wide Area Network (W-WAN) type wireless network, primarily on GPRS [ETS98] and UMTS type network. Other W-WAN type networks include for example CDPD [Sin99], Ricochet [Ami96] and GSM [Mon00]. The latencies and bandwidths used in our tests are adjusted roughly to mimic the GPRS / UMTS standards.

A wireless link has typically very different characteristics compared to a wired link. W-WANs tend to have a relatively low bandwidth and high bit error rate [Mon00]. The latency in wireless environment is typically higher than in wired environment. In wireless links, propagation delay is typically high. The delay results from special transmission schemes that have to be used in the transmission. In wireless networks packet losses typically do not occur due to congestion but merely due to data corruption [Liu02].

Depending on the current radio condition and the location of the mobile host, the wireless link can impose a significant amount of data corruption. After forward error correction, the average bit error rate in W-WAN systems can be as high as 10^{-3} in worst case. The link layer Automatic Repeat reQuest (ARQ) [FAI02] mechanism may be used to bring it down to zero [Mon00] if perfect ARQ persistency is used. However, because the link layer retransmissions are transparent to the applications, they are only seen as delayed packets if the retransmission is successful. If the delay is too long, a TCP sender has to retransmit the packet.

In wireless environment there may also be times when no useful data is transmitted at all (all packets are dropped). The situation may also change very fast for example when the device switches to the next link or goes for example to a tunnel which prevents transmissions. There may be no indication of such lag in the communication in advance and the lag may be totally transparent to the application level software. If link layer ARQ is used, the round-trip times may be large and variable. If packets are sent in bursts, however, only the first packet tend to experience high jitter [Cha02].

In a fixed network, the links are reliable and fast when compared to wireless networks. Being often the slowest link, the wireless link is therefore typically the bottleneck of the transmission. Because there are always a limited amount of buffer space that can be given to a single user, packet drops may increase at the last-hop router due to congestion.

GPRS is an example of a W-WAN network. GPRS works within a GSM network and provides a packet oriented service to customers. It shares the capacity of GSM radio channels and uses the base GSM network components. It also has some new elements to manage packet-oriented transfers better and works in asymmetric manner, giving more capacity to the downlink than to the up-link. In GPRS there are four possible coding methods and eight possible time slots [Bet99]. The maximum transfer rates in one time slot using different codings is described in table 1. Because the error rate of the last two coding methods is too high, only the first two are currently supported by most of the GPRS networks of today [Cha02].

There are 29 multi slot classes which a GPRS device may offer support for. The support classes define the number of time slots available both for up-link and downlink as well as the coding which will be used in data transfers. he classes are described in table 2. For example a class 8 GPRS device would be able to transfer up to 4*13.4kbps on the downlink and 13.4 kbps on the uplink if coding CS2 would be used. Maximum number of time slots (Max # of slots) defines how many time slots is available at a time. For example a class 10 device could not use all four time slots for downlink traffic together with using two time slots for uplink traffic because the maximum number of time slots is

five.

Coding	Maximum transfer rate / time slot
CS1	9.05 kbps
CS2	13.4 kbps
CS3	15.6 kbps
CS4	21.4 kbps

Table 1: Transfer rates of GPRS using different codings in one time slot

Since there are 8 time slots available, the theoretical throughput of a high-end GPRS terminal is 171.2 kbps (8 x 21.4 kilobits per second). EDGE (Enhanced Data rates for Global/GSM Evolution) [Ina03] can however boost the speeds up to 500 kbps in the future. It is clear that the transfer rate is much lower than the theoretical maximum, because to achieve the maximum speed, a single user would have to take over all eight time slots without any error protection. The terminals may also have limitations which prevent concurrent send and receive. The current operators support only CS1 and CS2 codings, and offer only maximum of four+one time slots. Current devices offer up to class 8 GPRS support, making the theoretical maximum transfer speed of GPRS downlink 53.6 kbps (4 * 13.4 kbps) and of up-link 13.4 kbps in that class. Although classes 5-7 provide more speed to the up-link, the downlink speed is more important in many cases. The throughput provided by class 8 is quite well relative to the throughput of standard 56 kbps modem if mostly downlink is used.

GPRS allows reduced connection set-up times compared to GSM [Rah93]. Because GPRS is packet-oriented, it stresses the network only when data is actually transmitted. This improves the sufficiency of the limited radio frequencies. However being packet-oriented network, the access to radio channels is non-deterministic. One can have a packet ready to be sent at a time the channels are occupied by other users. If the protocols support QoS, a lower priority packet may have to wait if higher priority packets are being transferred. The delay caused for this can be considerably long. Also the transmission errors encountered on the radio link may also slow down the data transfer. Therefore packet radio systems suffer from greater delays and especially greater delay variations than wired packet networks.

In this thesis we assume the wireless link to be GPRS or UMTS type link, transferring data 53.6 kbps. With enhanced encoding and channel allocation techniques, the link speed may be somewhat higher, about 60-70 kilobits per second. For the propagation delay we are using an estimate of 300 ms, which is typical to many W-WAN systems.

Class	# of time slots downlink	# of time slots uplink	Max # of slots
1	1	1	2
2	2	1	3
3	2	2	3
4	3	1	4
5	2	2	4
6	3	2	4
7	3	3	5
8	4	1	5
9	3	2	5
10	4	2	5
11	4	3	5
12	4	4	5
13	3	3	unlimited
14	4	4	unlimited
15	5	5	unlimited
16	6	6	unlimited
17	7	7	unlimited
18	8	8	unlimited
19	6	2	unlimited
20	6	3	unlimited
21	6	4	unlimited
22	6	4	unlimited
23	6	6	unlimited
24	8	2	unlimited
25	8	3	unlimited
26	8	4	unlimited
27	8	4	unlimited
28	8	6	unlimited
29	8	8	unlimited

Table 2: GPRS multi slot classes

3 TCP overview

In this section we discuss of the Transmission Control Protocol [Pos81] in general and in wireless environment. In addition we describe some differences between the Linux TCP implementation and IETF specifications. We assume the reader has a basic knowledge on TCP.

3.1 TCP properties

TCP has been developed to recover from out-of-order packets, duplicated packets and packet drops (missing packets). It provides reliable connection-oriented transportation to several upper level applications simultaneously by identifying each connection with a pair of sockets. Each data stream has state information, which includes information about window sizes and sequence numbers. The state information is initialized during the three-way handshake at the time of establishing a connection. With the sequence numbers the TCP can recover from error situations occurred in the communication system. In TCP data segments have to be acknowledged by the receiving TCP. In the ACK segment the next expected octet is indicated using its sequence number. The TCP uses cumulative acknowledgments to increase performance. With cumulative ACKs the receiver can acknowledge a number of segments at the same time.

TCP headers are used for controlling the validity of packets and for maintaining the window size. A checksum validates that a packet that is received is not corrupted. If the receiver detects a corrupted packet, it simply drops it. TCP sender will resend the packet eventually. TCP receiver sends its receive widow size (rwnd) with each ACK to the sender. Rwnd informs the sender how much data it may send beyond the acknowledged octet. TCP sender uses a timer to monitor data delivery in the absence of feedback from the data receiver. The length of the timer is referred as retransmission timeout (RTO). If an ACK has not arrived in time, RTO occurs and unacknowledged segment with lowest sequence number is retransmitted [Pax00]. RFC 1122 [Bra89] states that RTO must be calculated using Jacobson's algorithm [Jac88] which uses the following equations:

$$Diff = New\_RTT - SRTT$$
$$SRTT = SRTT + \delta * Diff$$
$$DEV = DEV + \rho * (|Diff| - DEV)$$
$$RTO = SRTT + \eta * DEV$$

TCP sender monitors the round-trip time (RTT) for packets and places it to New_RTT.

SRTT means "Smoothed RTT" and DEV is estimated mean deviation. δ and ρ are constants between 0 and 1. They are to be chosen by the implementation. It is stated in RFC 2988 [Pax00] that values (δ,ρ,η) should be $\delta = 1/8$, $\rho = 1/4$ and $\eta = 4$. They are also widely used in TCP implementations.

TCP receiver uses the sequence numbers also to detect out of order packets and to detect duplicated packets. The receiver has a number of buffers in which it can store misordered packets. The number is implementation specific, and may be user application settable. The packets are acknowledged in order. The out-of-order packets are not acknowledged with cumulative ACK until all packets between the last acknowledged packet and the misordered one are received. When an out-of-order packet arrives, TCP receiver sends a duplicate acknowledgment which acknowledges the last successfully received packet.

Slow-start algorithm is used to probe the capacity of network. In slow-start the sender sends packets first with low frequency and then with increasing frequency. Slow-start is used in the beginning of a transfer, after RTO and after an idle period. Slow-start is used until *congestion window* (cwnd) is equal or higher than *slow-start threshold* (ssthresh). Cwnd is a sender-side limit to the maximum amount of data that can be transmitted before receiving an ACK. *Initial Window* specifies the initial value of cwnd. Initial Window must be at most two segments. After receiving an ACK, the cwnd is typically increased by one maximum segment size (MSS), which is the highest number of octets allowed in a TCP segment. The use of slow-start with TCP is standardized in RFC 1122 [Bra89] and RFC 2581 [All99a].

Delayed acknowledgments are used to reduce traffic over the network. The receiver does not send the ACKs immediately, but waits for more packets to arrive and ACKs them simultaneously. RFC 2581 [All99a] states, that a TCP should implement the delayed acknowledgments mechanism. The receiver should send an acknowledgment for every second full-sized segment and the acknowledgment must not be delayed for more than 500 ms. In many implementations a value of 200 ms is used to make interactive programs more user friendly. If a packet fills up a hole in the sequence space, the ACK should be sent immediately [All99a].

Increased Initial Window increases the upper limit for TCP's Initial Window to between two and four segments. If the function specified in RFC 3390 [All02] is used, the upper bound for Initial Window is about four kilobytes. TCP may start with even larger Initial Window. If a large segment size used, the permitted initial window of two segments may be significantly larger than four kilobytes [All02].

As soon as the value of `cwnd` grows higher than the value of `ssthresh`, slow-start period ends and *congestion avoidance* begins. During congestion avoidance, `cwnd` is incremented by one segment per round trip time. Congestion avoidance continues until congestion is observed or the TCP connection ends. If congestion is detected due to RTO, the value of `ssthresh` is updated to be half of the outstanding segments in the network (flightsize) and the `cwnd` is set to one segment. Because `ssthresh` is lowered, congestion avoidance will next time start sooner and the capacity of network should not be exceeded as quickly. If RTO occurs, the current value of RTO has to be multiplied by a constant, which must be at least two [Pax00]. This avoids multiple RTOs from occurring unnecessarily.

TCP receiver should send an immediate ACK when a retransmitted segment fills a hole in the receivers buffer. *Fast retransmit* algorithm uses the arrival of three duplicate ACKs without arrival of any other intervening packets as an indication of a lost segment. When three duplicate ACKs have been received, TCP performs fast retransmit by sending the first unacknowledged segment without waiting the retransmission timer to expire. With the fast retransmit algorithm, slow-start can be avoided. The duplicate ACKs indicate not only the most likely missing segment, but also that packets are leaving from the network [All99a]. After the fast retransmit, the TCP sender continues with *Fast Recovery* until all lost segments have been recovered. The fast recovery algorithm does not work well in situations where multiple segments are dropped in a single window resulting TCP to experience poor performance [Mat96]. This is because it only allows one retransmission in a roundtrip time. The situation can be improved with NewReno TCP modification [Flo99] and TCP *selective acknowledgments* (SACK) [Mat96].

If the TCP connection's congestion window is small causing only limited number of acknowledgments to be sent by the TCP receiver, the TCP's loss recovery strategies may not work well. The congestion window may be small for example because there is only limited amount of data to be sent or because of the limit imposed by the receivers advertised window. This prevents the Fast Retransmit algorithm from being triggered because the three duplicate acknowledgments are not generated.

Limited Transmit [All01] extends the fast retransmit algorithm for TCP connections with small congestion windows. If a sender has previously unsent data queued for transmission, it calls for sending a new data segment in response to each of the first two duplicate acknowledgments that arrive in the sender. Performance is increased, because some of the retransmission timeouts can possibly be avoided [Ina03].

Selective acknowledgments ameliorate the poor performance of TCP when multiple packet-drops occur in a window by giving the receiver the ability to inform TCP sender about segments that have arrived correctly. SACK must be supported by both receiver

and sender to work. The use of SACK is agreed in the beginning of a TCP connection in the SYN segments. When the use of SACK is permitted, the SACK option may be sent over an established connection from the receiver to the sender. There are 40 bytes available for TCP options and `n` SACK blocks take (8*`n`+2) bytes of space, thus a maximum of 4 SACK blocks may be specified at once [Mat96].

The SACK blocks can also be used for other purposes. The first block of the SACK option field can be used to report the sequence numbers of the packet that triggered the acknowledgment. This enhancement is called *Duplicate-SACK* (D-SACK) [Flo00] and makes the TCP sender able to conclude the order of packets received by the TCP receiver. With this information the TCP sender is able to infer whether it has retransmitted a segment and reduced its congestion control parameters unnecessarily and thus revert the parameters to their preceding values. D-SACK could improve performance in environments where reordered packets, lost acknowledgments, packet replication or early retransmit timeouts exist. The use of D-SACK does not require additional negotiation between a TCP sender and TCP receiver, but may only be used if both are SACK capable.

The *New Reno* TCP modification ameliorates TCP performance during fast retransmit, in case that SACK information is not available. It introduces a new variable *recover*, in which the highest sequence number of transmitted packets is recorded. If the retransmitted packet acknowledges all unacknowledged packets outstanding in the network including the one whose sequence number is recorded in *recover*, the fast recovery phase ends. Otherwise partial acknowledgment is detected. In this case the first unacknowledged packet is retransmitted and fast recovery continues. The New Reno modification increases TCP performance noticeable in many situations compared to the standard fast retransmit algorithm.

To make more accurate roundtrip time measurements, *TCP Timestamps option* may be used. The TCP sender may mark each TCP segment with a time stamp, which is then echoed back with the acknowledgment by the receiver [Jac92]. This gives several advantages. The TCP sender can calculate exact roundtrip times for the segments and use them as a base when deriving the retransmission timeout estimator. The use of TCP Timestamps enables algorithms to recognize old segments from previous incarnations of the TCP connection. TCP Timestamps also allow detection of unnecessary retransmissions. The Eiffel Algorithm [Lud00] suggests that if an acknowledgment of a retransmitted segment echoes a timestamp that is older than the timestamp of the retransmitted segment, the original segment has arrived and the retransmission was unnecessary. If the TCP Timestamps option is used together with the SACK option, the maximum number of SACK blocks is reduced to three [Sar02a].

Forward RTO-Recovery (F-RTO) [Sar03] algorithm improves TCP performance by avoiding the unnecessary retransmissions after spurious retransmission timeout without using any additional TCP options. The F-RTO algorithm affects to the behavior of TCP sender only when a retransmission timeout has occurred. F-RTO enhanced TCP sender transmits two new segments of data if the first ACK after a retransmission triggered by RTO advances the window, while conventional TCP continues the retransmissions. If also the second incoming acknowledgment advances the window, RTO was probably spurious. If either of the two acknowledgments is a duplicate acknowledgment, the sender proceeds similarly to the regular RTO recovery algorithm. The F-RTO algorithm may improve the performance of TCP in case of spurious RTO due to sudden delays compared to the conventional TCP by avoiding unnecessary retransmission of a full TCP window after a spurious retransmission timeout.

Control Block Interdependence (CBI) [Tou97] allows the TCP to share a part of the TCP state among similar concurrent connections, or across similar connection instances. TCP state includes a combination RTT estimates, congestion control information, and process information. In conventional TCP the state is maintained on a per-connection basis in the TCP control block. CBI can improve a TCP transmission for example by avoiding slow-start overshoots which may cause multiple packets to be dropped for congestion due to too fast transfer rate and by increasing the Initial Window. It may also improve stability between concurrent TCP transfers while maintaining backward-compatibility with existing implementations.

Congestion control systems described above rely on the measurements of the already transmitted data. However, the most effective detection of congestion can occur in the gateways. If explicit feedback from the gateway can be obtained, more efficient algorithms can be developed also to the TCP protocol. Jacobson suggested in [Jac88] that gateways could monitor the average queue, and randomly drop packets when congestion is detected. This idea is a precursor to the *Early Random Drop* (ERD) Active Queue Management algorithm [Has89].

Random Early Detection (RED) [Flo93] gateways attempt to detect the incipient congestion by measuring the average queue size. If the average size of the queue exceeds a preset threshold, the gateway drops packets with a certain probability. The probability is derived using a function of the average queue size. The probability that the gateway drops a packet of particular TCP connection is roughly proportional to the connection's share of the bandwidth through the gateway. If the average queue size exceeds a maximum threshold, the RED gateway drops every packet that arrives at the gateway. RED has the potential to overcome some of the problems discovered in Drop-Tail, such as synchro-

nization of TCP flows and correlation of the drop events (multiple packets being dropped in a sequence) The configuration of RED has been a problem since RED's first proposal. If RED is not properly configured, it can induce network instability and major traffic disruption [Fir00].

Explicit Congestion Notification (ECN) [Ram01] can be used with the help of RED. Instead of dropping a packet, the routers set the Congestion Experienced (CE) code point in the IP header of packets from ECN-capable transports. If the gateway sets the CE code point in the IP header, congestion is detected. TCP receiver echoes the CE in TCP header of its acknowledgment to the TCP sender making it able to voluntarily reduce the transfer rate before packet drops occur. This could lead to overall increase of stability in network traffic.

3.2 TCP over wireless links

On wired networks almost all packet drops happen due to congestion, and corrupted packets are very exceptional. Based on this observation, the Internet community has over the years developed new techniques to the TCP to make it more robust to congestion. However, networks with wireless links also suffer from significant non-congestion related losses due to reasons such as bit errors and handoffs. TCP responds to all these losses by invoking congestion control and avoidance algorithms. This may mean shrinking the congestion window, invoking slow start and backing off retransmission timers, which results in noticeable performance degradation.

In addition, the packet size in wireless links is often much smaller than over a wired network. For example in CDPD Networks [Ago96], the packet size is only 128 bytes. This causes heavy fragmentation when an IP packet is transmitted over the wireless link. Loss of a fragment initiates error recovery and congestion control mechanisms at the TCP sender. The optimal size of a packet depends on the error conditions on the wireless link. By choosing an adequate packet size, the performance can be improved up to 30 % without changing anything in the transport or link layer protocols at any host [Bak97].

There are two different approaches to improving TCP performance in systems which include a wireless link. The first tries to hide the wireless link (the non-congestion-related losses) from the sender. Thus the sender TCP system does not need any modifications. The second aims to make the sender aware of the existence of the wireless hop and realize that some packet drops are not due to congestion. The first one can be achieved by link-layer modifications or by using splitted connections in which the TCP connection is terminated to the last-hop router, and the wireless communication is done by using dif-

ferent protocols or protocol variants. With split-connections, the wireless link options can be fully tuned for the specific wireless link, and great benefit can be obtained. This option is unfortunately not often possible to have. For example GPRS and GSM connections are established environments where the conditions may change a lot in a short period of time.

The second approach uses some form of selective acknowledgments (SACKs) to make the receiver able to notify the sender about multiple packet losses in a window without affecting a coarse timeout. The sender tries to distinguish between congestion-related and other losses by using an Explicit Loss Notification (ELN) mechanism [Bal98]. In this model, the new features proposed by IETF, such as ECN, are also useful.

3.3 Congestion control in Linux TCP

Linux implements a number of TCP enhancements proposed by the IETF. Some of them, like ECN and D-SACK, are not widely deployed in TCP implementations, but are likely to be in the future. Because Linux combines several features proposed in different RFCs, some details are not implemented exactly according to the algorithms given in the RFCs. In most cases, however, none of the requirements given by the IETF are violated. Table 3 describes the specifications implemented in Linux TCP.

Specification	**Status**
RFC 1323 (Performance Extensions)	+
RFC 2018 (SACK)	+
RFC 2140 (Control Block Interdependence)	+
RFC 2581 (Congestion control)	*
RFC 2582 (NewReno)	*
RFC 2861 (Cwnd validation)	+
RFC 2883 (D-SACK)	+
RFC 2988 (RTO calculation)	*
RFC 3042 (Limited transmit)	+
RFC 3168 (ECN)	+

Table 3: TCP congestion control related IETF specifications implemented in Linux. + = implemented, * = implemented, but details differ from specification [Sar02a].

TCP specifications and many implementations compare `cwnd` to the number of transmitted octets, whereas Linux tracks the number of outstanding segments in units of full-sized packets. This makes Linux more conservative if small segments are used: in

byte-based implementation several segments can be transmitted to network for each full-sized segment in the congestion window, but in packet-based implementation only one packet can be transmitted for each segment in the congestion window, regardless of its size. Linux uses *Congestion Window Validation* (CWV) [Han00] as precaution to make sure, the congestion window is not calculated incorrectly. The CWV is triggered if the congestion window is not fully used. The method is suggested in RFC 2681 [Alm99].

Some other implementations have coarse-grained retransmission timer with granularity for up to 500 ms. Considering that most of the present networks provide round-trip times less than 500 ms, the feasibility of the traditional transmission timer algorithm specified by IETF is not very good. In Linux TCP, the minimum RTO limit is 200 ms as the limit proposed in RFC 2988 [Pax00] is 1000 ms. The retransmission timer in Linux has granularity of 10 ms and the sender takes a round-trip time for each segment. This makes it able to achieve more accurate estimations for the retransmission timer. The traditional algorithm for retransmission timeout computation has been found problematic in some network environments [Lud00] especially if round-trip times are taken for each segment and a fine-grained timer is used. The Linux implementation solves the problem by giving less weight for the measured mean deviance when the measured RTT decreases significantly below the average. This avoids the unwanted peak in the RTO estimator value and still maintains the conservative behavior [Sar02a].

Because the current mechanisms in the Internet do not give the TCP sender enough information to determine if a packet is lost or just delayed, the congestion window may be reduced unnecessarily. Linux provides mechanisms to detect unnecessary congestion windows adjustments afterwards and revert it to its preceding value if needed. This mechanism is called Linux undo mechanism. An unnecessary retransmission of a segment can be detected in two ways. Firstly, the TCP receiver can inform the TCP sender with a D-SACK block that the incoming segment was a duplicate. If all the retransmitted segments cause a D-SACK announcement, the adjustment of the recovery period is not needed. Secondly, the TCP sender can detect the unnecessary retransmission with the TCP Timestamps option. When used, this option gives exact time information of the segments. When echoed in the acknowledgment, the sender can determine if the acknowledgment is from the former or from the later transmission. For example the Eifel algorithm uses similar method for detecting spurious retransmissions.

To avoid the Silly Window Syndrome, TCP receiver should not delay the acknowledgments more than 500 ms [All99a]. Linux TCP uses adjustable delay with a maximum delay time of 200 ms. The receiver estimates the round-trip time, and adjusts the value to double of the estimated value [Sar02a]. Similar approach is also suggested in RFC 813

[Cla82]. Linux TCP receiver does not delay acknowledgments for the first incoming segments at the beginning of a connection to speed up the growth of the congestion window size. These are called *quick acknowledgments*. The number of quick acknowledgments is at most the number of segments required to reach the receivers advertised window limit. Linux TCP receiver also tries to detect if the traffic is bidirectional, in which case the quick acknowledgments are disabled to so that the acknowledgment can be sent together with a transmitted data segment.

Linux *Fast retransmit* algorithm differs from the one suggested in RFC 2581 [All99a]. TCP sender adjusts the threshold for triggering fast retransmit dynamically. It is possible, that the third duplicate acknowledgment does not trigger fast retransmit in all situations in Linux. When entering the fast recovery, the Linux sender does not reduce the congestion window at once as RFC 2581 [All99a] and RFC 2582 [Flo99] suggest. Instead, the congestion window size is reduced gradually, by one segment per two incoming acknowledgments [Sar02a]. This mechanism is called *rate-halving* [Mat99]. It avoids pauses in transmission, but is slightly too aggressive.

RFC 2018 [Mat96] does not give detailed specification of the congestion control algorithm that should be used with SACK in a TCP implementation, but merely defines the basic usage and format of the SACK blocks. Linux sender uses FACK congestion control algorithm until it detects reordering and changes then to a more conservative algorithm. The IETF has recently defined a congestion control algorithm to be used with SACK [Bla03]. The algorithm is similar to the more conservative SACK alternative in Linux [Bla03]. Linux also follows the D-SACK basics given in RFC 2883 [Flo00].

The TCP Timestamps and window scaling options defined in RFC 1323 [Jac92] are implemented in Linux TCP. It also implements the limited transmit enhancement defined in RFC 3042 [All01]. The Linux sender however submits a new segment not just for the first two of them, but up to the reordering estimate if the reordering estimator is increased from the default [Sar02a].

4 WWW traffic

In this section we discuss the typical HTTP requests and how they affect on TCP communication. In subsection 4.1 we discuss general WWW traffic characteristics. In subsection 4.2 we discuss the features of HTTP 1.0 and 1.1 protocols and their effect in TCP communication.

4.1 WWW content characteristics

Modeling the WWW traffic is a challenge for several reasons. The network is very heterogeneous having different server and client programs interacting with each other. The programs behave differently and have different parameter values in use. There are also two coexisting HTTP versions with different features in use. The different implementations of TCP protocol behave slightly differently, the users of WWW browsers behave differently, and the WWW environment is constantly changing. For example, having frames in web pages causes multiple HTML documents to be loaded simultaneously, each having their own embedded images and other in-line objects. When a single request generates multiple pages, the boundary between web pages becomes blurred. Increasing amount of pages use new extensions such as flash animations, which affects to the file sizes and types. The behavior of users changes also with the new techniques.

To ensure that the traffic that will be analyzed is realistic, the typical file sizes and traffic models have to be discussed. The traffic model in the World Wide Web is suggested to have a heavy-tailed property in a number of studies. Some have observed, however, that the tail is becoming lighter [Bar98]. The heavy-tailed property is suggested as a causal mechanism for the presence of self-similarity[1] in web traffic [Cro97]. The long-tailed property of arrival times and transfer times is found to have little evidence since the file sizes are not long-tailed but log normal. Some evidence is found for long-tailed burst sizes, however [Dow01]. In this thesis the heavy-tailed property does not play a vital role, as the main focus is on analyzing the TCP behavior on wireless environment. It is interesting only in means of defining the typical file sizes and the typical number of files transmitted when retrieving a WWW page.

Normally the WWW traffic is asynchronous, having more traffic on the downlink than on the up-link in the client machines. This has caused links to provide more capacity

[1] A process is self-similar with another process if the processes share the same auto-correlation function. The degree of self-similarity is expressed using values]0.5,1.0[. This value is called Hurst parameter. The closer the parameter is to 1, the more self-similar a process is.

to the downlink. However in case of errors and redirections, the response from a server can be very short, only a HTTP header. The response is typically followed with a new request. This results that the amount of transferred data may actually be higher on the up-link than on the downlink. These situations are however not very common, therefore not very interesting neither.

Previously a web page has been the basic unit of WWW request. One request has resulted in one fetched page. Today, the unit should merely be the web request, which may include several fetched objects. There are two kinds of objects that we are interested in: main object and in-line object. By main object we mean the HTML page sent with the first request. The main object includes references to in-line objects, which must also be loaded to correctly display the page. Typical in-line objects are for example images, Java applets or flash animations, and the transmission of the main object represents often only a minor part of the whole transmission.

To create adequate traffic, the HTML page in the response has to be parsed, and all in-line objects have to be fetched as well. The object sizes should be discussed. According to the measurements the contents in web requests are in relation described in table 4 [Cho99].

	Mean	**Median**
Request size	360.4	344
Main object size	10710	6094
In-line object size	7758	1931
Number of in-line objects	5.55	2

Table 4: Object sizes (in bytes) and amount of in-line objects in requests

The mean number of in-line objects shown above is almost three times larger than the mean observed earlier [Mah97]. The difference can be explained by the fact that the number of multimedia objects is increasing as pages are becoming more complex. The hit ratio of local caches have also dropped, which causes more documents to be actually fetched from the network. Since table 4 is based on measurements from 1999, the number is probably even higher. Especially companies providing multimedia services tend to have a lot of in-line objects in their pages. A quick look in some popular portals showed, that the number of in-line objects was more than 60 in many main pages, and more than 130 in a few main pages.

The subsequent requests typically have fewer in-line objects. That is because the subsequent requests are often in-line objects themselves, and with the use of browser caches the requests for same in-line objects in different pages can be omitted. The users

of wireless devices often prefer to use lighter versions of pages, if available, and lighter versions of pages designed for PDAs also exist more often today. A log based on real traffic from an Internet service provider showed however, that noticeable amount of requests from 576 to 2000 bytes in size exist.

4.2 HTTP over TCP

WWW traffic uses HTTP protocol to the communication between WWW client and -server. In practice, the HTTP protocol is implemented over TCP protocol, and therefore it shares the properties of the TCP implementations on client and server systems. There are two versions of HTTP protocol currently available: HTTP 1.0 and HTTP 1.1. HTTP 1.0 may support multiple connections and keep-alive features. The protocols and the features mentioned are discussed in more detail.

HTTP 1.0 protocol [Ber96] without support for multiple connections or keep-alive is a simple request / response protocol, which is not designed for heavy use. It requires all items to be downloaded serially, each having its own TCP connection. Since typical files in portals in the web are quite small, the congestion avoidance phase may never be reached during a connection, which causes several performance loss in the transfer rate. The high latency of wireless links increases the times spent on building up a connection, which causes notable loss in performance. HTTP 1.0 with no additional features is not used by modern browsers today.

In HTTP 1.0 with multiple connections, the browser opens several parallel TCP connections to speed up the download process. The maximum number of connections is limited by the browser. Despite all open connections still spend almost all the transfer time in slow start, higher cumulative transfer rate can be achieved with the use of several concurrent connections, since the capacity of the line is better in use. Current browsers use typically four to six concurrent connections. HTTP with multiple connections is still widely in use and requires no extra modifications in server software compared to the plain HTTP 1.0.

HTTP 1.0 with keep-alive extends the protocol with persistent connections. Multiple connections are possible, and the connections are not closed immediately a transfer ends, but a new object can be downloaded using the open connection. This HTTP extension requires modifications to both client and server software. Today, many HTTP servers support persistent connections, but the administrators usually disable the feature to save server's TCP sockets. Even if the feature is enabled, the time in which a new request must be placed is set to be very short. Processing a subsequent requests from a HTML

page takes time, and the client often fails to place another request to the channel before the timeout, and thus is often unable to take advantage of the feature. Even if the client manages to place its order in time, the connection has possibly been idle for too long resulting in another slow start phase. The use of using persistent connections gives seldom any benefit over using HTTP 1.0 with multiple connections [Cho99].

In HTTP 1.1 [Fie97], the requests are pipelined to maximize the use of the persistent connections. The persistent connections themselves are very similar to the keep-alive connection in HTTP 1.0, with the exception of being for a proxy. As in HTTP 1.0 with multiple connections, the browser limits the amount of concurrent connections. The maximum number of simultaneous connections to a server in HTTP 1.1 should be two.In HTTP 1.1, a client may request a new object before the previous connection is finished and the request is placed in queue if the maximum number of simultaneous connections to a server are in use. A queued request will be started as soon as a connection becomes available. Pipelined requests make the use of persistent connections far more efficient since a same connection can often actually be used. The pipelining makes the server able to start sending a new file immediately without a lag in the transmission, which might cause the drawback of the multiple slow start phases. HTTP 1.1 is widely supported by the web servers in the Internet today. The support for the protocol is disabled, however, in many web servers for the same reason as in HTTP 1.0 with persistent connections: to save server resources.

An advanced proxy might be used to improve the HTTP transfers. In Mowgli [Lil96] the network was splitted into two parts: wireless and fixed and other protocols were used to transfer the data to the wireless device. A specialized proxy might try to parse WWW pages requested and transfer in-line objects in advance to a local media. When client would place a request, the results would already be waiting in the proxy server and can be transferred to the client immediately. If persistent connections were used, the same connection could be used since the requested object is ready to be transferred. This kind of proxy would be very helpful if located just before the wireless part of the network.

5 Test Arrangements

This section describes the test arrangements in the experiments. Subsection 5.1 discusses about the goals of this research and the methods that we used to achieve them. Subsection 5.2 describes how the test environment is modeled. In subsection 5.3 we define our test cases and workload. Subsection 5.4 the TCP enhancements used are discussed and subsection 5.5 defines which metrics were used to evaluate the results. Finally we discuss about the validity and the coverage of our experiments in subsection 5.6.

5.1 Objectives and methods

Our objective is to evaluate the HTTP 1.0 traffic performance in wireless environment with great variation on prevalent network conditions. The link may experience unexpected black-outs increasing the packet error rate dramatically. The link is capable of link layer retransmissions. These retransmissions reduce the effective error rate of the wireless link greatly, but add additional delays to the TCP transmissions of packets.

Our test cases are defined by the following properties:

1. the emulated network environment and link model,
2. the workload model of the test set and
3. the TCP variants that are used.

The target environment is emulated using the Seawind Wireless Network Emulator [Koj01]. With Seawind the end hosts can run a real implementation of a TCP/IP stack, and the network characteristics are emulated with the emulator. The use of Seawind has many benefits compared to measuring protocol performance in natural environment. The architecture of the network and the properties of the link can be easily adjusted and tuned. We can easily test how different network conditions affect to the TCP performance. We can also use exactly the same network conditions in several tests, which makes it possible to compare the performance of different TCP implementations. Since the tests are parameterized, we can make predefined test runs with different configurations and run them automatically.

We must however be careful when using an emulated environment. If we make inaccurate approximations when defining the parameters of the emulator, we have a different network environment than we wanted to analyze. Defining the parameters of an exact

network may be very difficult. Firstly we may not have enough information of the network, and secondly we may not be able to verify that the parameters generate exactly the same network behavior. In our case, although we are emulating a GPRS/UMTS like network, we are not interested in the exact modeling of either network but trying to have a more general aspect to the research process.

To define the network parameters, we first run a number of preliminary tests with a limited amount of replications and analyze the results. The results also indicated which TCP enhancements and combinations should have more test runs and which do not bring new behaviors. By running the preliminary tests we minimized the work that had to be repeated while fine-tuning the network environment and link characteristics. The actual tests are run with thirty replications to separate the coincidental events from the behavioral TCP protocol characteristics on our test environment.

Since the emulator is time critical while handling the delays and other events, we have to make sure it has all the possible CPU time available. We made sure that there was no unnecessary processes running in the emulation host. Since the Seawind software itself makes I/O requests and loads the CPU, and the Linux Operating System does not guarantee the accuracy of timer events, there may still be additional delay added to the transmission delay. Seawind logs the actual event times and prints a warning if a delay is exceeded by more than 10 ms. We made an automated check for the warning to be certain that an oversleep could not confuse us while analyzing the results. Any significant oversleeps can be taken into account and the tests can be run again if necessary. Less than 10 ms inaccuracy of the timers is not significant compared to the delays already present in the wireless link. The inaccuracy in delays was typically no more than 1-2 ms. In any case, the possible effects of the inaccuracies would not show directly in our statistics because we use the median value.

The WWW traffic is generated using an HTTP traffic generator developed earlier in the University of Helsinki. We made a few modifications to the tool to allow us to have full control over the sizes of requests and responses and incorporated the tool into Seawind to have the benefits of automated test runs and Graphical User Interface. With the tool we can simulate customizable HTTP requests using HTTP 1.0 like traffic. The tool makes a HTTP request for each object in a new connection. Defining the workload is very important, because the results are irrelevant if the workload does not conform to reality. To analyze the results we have to define metrics which measure the performance of TCP well and use them in the analysis.

It has been suggested that the implementation selected as the baseline should be the state-of-art TCP implementation of the near future [All99b]. Many of the current TCP

implementations already support a number TCP enhancements suggested by the IETF. Increasing number of enhancements are being supported by the implementations used in the Internet today, and therefore we do not choose to run the tests with a plain TCP implementation. Instead we choose a state-of-art TCP as a baseline, and compare its performance with a TCP which includes some additional enhancements.

In the tests we use the latest release of Linux kernel, which is currently 2.4.20. This version implements many TCP enhancements specified by the IETF. As a baseline, we have chosen a set of TCP enhancements which includes Increased Initial Window, Limited Transmit, Selective Acknowledgments and TCP Timestamps. Alternatively we have disabled the TCP Timestamps Option to disable the Linux undo mechanism, which is an Eifel like algorithm for detecting unnecessary retransmissions (see subsection 3.3) [Sar02a]. These enhancements were discussed in section 3. To make sure that our TCP implementation is not limited to the Linux TCP, we have used a modified version of the Linux kernel. Firstly, the modified version disabled the Rate Halving algorithm [Mat99] and Control Block Interdependence [Tou97], which are enabled by default in Linux TCP. Secondly it changes the way Linux uses Delayed Acknowledgments [Cla82].

By default a Linux TCP receiver sends acknowledgments for at least every second segment as specified in RFC 2581 [All99a]. In addition the Linux TCP receiver adjusts the timer for delayed acknowledgments dynamically and estimates the doubled packet inter arrival time [Sar02a]. Like discussed in section 3, the specifications of Delayed Acknowledgments do not mandate any specific delay time, but many implementations use a static delay of 200 ms. In the modified version of the Linux kernel the delayed acknowledgment estimation implements the static delay of 200 ms. The reason the behavior is changed is that a variable delay is quite difficult when evaluating different test cases. We also feel that our results would be too specific to the Linux operating system if we use an implementation that is only used in Linux TCP.

Link model	**Max. number of retransmissions**
Lossy link with low ARQ persistency	1
Lossy link with medium ARQ persistency	2
Lossy link with high ARQ persistency	3

Table 5: Link layer retransmission policies

To be able to make conclusions on the link layer error correction's effect on the TCP transfers, we have different link layer retransmission policies, one of which retransmits a lost frame once, one of which at most twice and one of which up to three times. Table 5

describes the link models and the maximum number of retransmissions in the link layer of each model. In each model the packet is dropped if the last retransmission fails. With low ARQ persistency we can expect to have a relatively high residual frame loss rate, which can cause very bad performance in TCP if many packets are dropped in a single TCP window. Single packet drops should not have as bad an effect in the performance because the TCP SACK is in use. With medium ARQ persistency the number of link layer retransmissions is often enough to correct a transmission error, but in most cases the delays are not long enough to cause a retransmission timeout. In this type the TCP has to have to deal with both dropped packets and short delays in transmissions, which makes us able to study how the link layer error correction and the transport layer error correction interact. With high ARQ persistency the number of retransmissions is enough to recover from almost all of the frame losses. However the delay caused by three retransmissions tends to be long enough to cause the TCP retransmission timer to expire spuriously. To improve TCP performance in these situations D-SACK [Flo00], F-RTO [Sar03] and Linux Eifel type Undo mechanism [Sar02a] with TCP Timestamps [Jac92] are evaluated.

To analyze behavior caused by errors we first analyze the optimal cases in which no packets are dropped due to errors in the link. This includes studying both the TCP enhancements and our baseline TCP and goes through the differences in the TCP performance between them. Then we run tests with same workloads in environment, which consists a lossy link which is capable of retransmitting lost frames.

5.2 Modeling the environment

The environment we are modeling consists of a mobile host which acts as a WWW client and a fixed host acting as a WWW server. The mobile host communicates with the remote server using HTTP 1.0 / TCP protocol via a point-to-point wireless link and a last-hop router. The link between the last-hop router and the remote server is a high capacity fixed link. We are assuming that the fixed link does not drop packets nor causes a notable additional delay. We are using a wireless link with a bandwidth of 64000 bits per second in our tests. There is no traffic on the fixed link and thus it is clear that the available bandwidth of the fixed link is several magnitudes higher than the bandwidth of the wireless link.

Figure 2 illustrates the target network and the emulated network environments. Upper section of the figure describes the elements of the target environment which are being emulated. The bottom section illustrates the emulation environment and our approach to emulate the target environment. The figure also describes the associations between the target environment and the emulation environment. The buffer at the last-hop router is

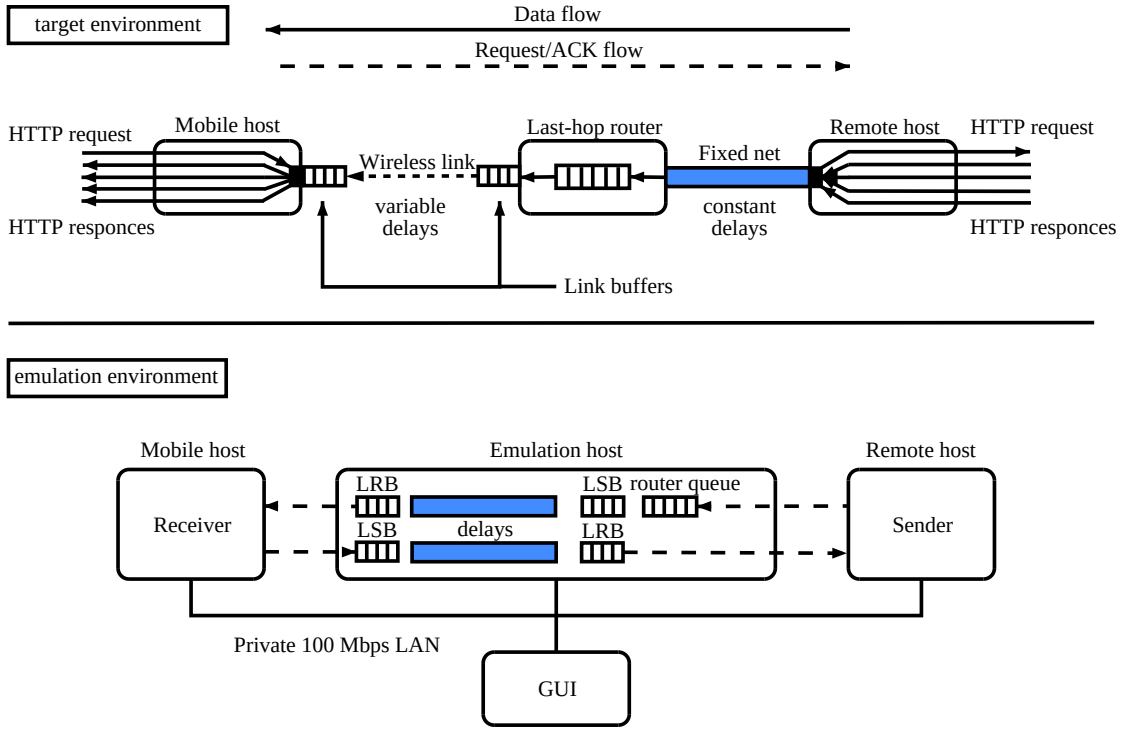

Figure 2: Elements of the target network and the architecture of the emulated network.

big enough to store 20 packets of downlink data. The size of up-link buffer at the last-hop router does not have any effect on performance since it should not accumulate packets as the packets arriving to it from the wireless link can be forwarded immediately to the fixed network.

To be able to emulate link level retransmissions over unreliable link we need link buffers at both sides of the link. The sender puts the data to the *Link Send Buffer* (LSB) from which it is transmitted to the other end of the link where it is placed to the *Link Receive Buffer* (LRB). To be able to communicate to both directions we need a total of four buffers dedicated to this function. If a frame is lost, the receiving end of the link stores the following segments to the LRB while the retransmission of the frame is taking place. This emulates in-order delivery of frames to the upper protocol layers. When retransmission of a frame is completed successfully, all frames arrived in order can be released from the link receive buffer. In our tests LSB and LRB buffers have 9600 bytes of capacity, which is roughly 2*BDP of the link. With a maximum transmission unit of 576 bytes each buffer can store up to 16 packets.

The Seawind wireless network emulator is used to emulate the wireless link, the link buffers and the router buffer as depicted in figure 2. In our test setup we have three

computers: one for the mobile client, one for the remote server and one for the emulation process. Each of the computers is a Pentium class Celeron. All the computers in private network are running Linux operating system. The *emulation host* takes care of the last-hop router and link emulation of the target environment.

Packet losses on the wireless link are modeled with a two-state Markov model. In a *good state* we have an error probability of 0%. In a *bad state* we have an error probability of 63%. Such a high error rate may take place for example when there are obstacles between the mobile host and the transceivers on the other side of the wireless link. The lengths of good states are modeled with an exponential function and the lengths of bad states with a uniform type function. The durations and function types of the states are described in table 6. With the mean of 6 seconds of the good state we will have approximately one bad state per test set in short tests, two in the medium tests and three to four in long tests. In our tests we will use an MTU of 576 bytes, which is quite typical value with low bandwidth links.

Parameter	**Good state**	**Bad state**
Error probability	0 %	63 %
Type of state length function	exponential	uniform
Min value	0 ms	200 ms
Max value	9 s	1.9 s
Mean	6 s	-
Retransmission delay	700 ms	700 ms
Number of retransmissions	1/2/3	1/2/3

Table 6: The lengths of the states and the maximum number of retransmissions in tests.

Link layer retransmission is emulated by targeting additional *recovery delay* to the packet that would otherwise be dropped. During the retransmission no later arriving packets are released from the link receive buffer. After the recovery delay, the emulator calculates if the retransmitted packet should be dropped. All retransmissions take 700 ms which is multiplied by the number of retransmissions needed. Last-hop router's queue is emulated in the Seawind with the tail-drop algorithm. Table 7 summarizes our emulated network configuration. With some parameters we have different values depending on the test cases.

The traffic generators are run in the end hosts. In the remote host we run a simplified WWW server which is capable of serving HTTP 1.0 type requests. The responses are sent like in normal WWW servers. The Mobile host runs the WWW client software, which is a simple HTTP 1.0 request generator that can be configured to fetch main objects and in-line

Parameter	Downlink value	Up-link value
Router queue length	20 units	1 unit
Queue drop policy	tail-drop	tail-drop
Link send buffer size	9600 bytes	9600 bytes
Link receive buffer size	9600 bytes	9600 bytes
Transmission rate	64000 bps	64000 bps
Propagation delay	300 ms	300 ms
Error handling	retransmit up to 1/2/3 times	retransmit up to 1/2/3 times
Packet error rate	0/63 %	0/63%
MTU	576 bytes	576 bytes

Table 7: Seawind parameters used in our tests.

objects of given size. The maximum amount of concurrent connects can be configured as well as the maximum amount of concurrent connections. We use four concurrent connects and connections in our test. With the tool we can have main objects of different sizes and multiple in-line objects with a given size. Server sends packets using the maximum payload size available.

5.3 Workload

We have selected six sets of workloads, which represent different types of WWW pages to be fetched. Each set consists a main object and a number of in-line objects. The in-line objects could be any type of an embedded object in the web page, most typically an image. The sizes and quantities of the objects in the first five experiments are chosen according to the earlier research [Cho99][Bar98][Mah97] and existing statistical data which was obtained from a real Internet Service Provider's logs.

All object sizes are rounded to be multiplicatives of the maximum segment size (MSS) of the test case, which enables us to send always full segments of data. The default assumption is that the *Maximum Transmission Unit* is 576 octets [Pos83]. When opening a connection TCP can send an MSS option with the value equal MTU - IP Header - TCP Header Length. With MTU of 576 bytes, the MSS is:

$$MSS = MTU - IPHdrLen - TCPHdrLen$$
$$= 576\ bytes - 20\ bytes - 20\ bytes = 536\ bytes$$

In many of our tests we have the TCP Timestamps Option implemented in the base line TCP. This option uses additional 12 bytes, which reduces the maximum segment size

to 524 bytes. In the experiments we use three main object sizes and two in-line object sizes. The classification of the object sizes is given in table 8. Most of the tests are run with a small or medium sized main object, only the last test case has a large main object. In-line objects are small or medium sized. Table 9 summarizes the selected workloads. In the table the labels are coded in the following way: `ms+`*`n`*`is`, where `ms` is main object size, `is` is in-line object size and *n* the quantity of in-line objects.

object type	**small object size**	**medium object size**	**large object size**
main object	6288 bytes	12576 bytes	71788 bytes
in-line object	2096 bytes	8384 bytes	-

Table 8: Sizes of object types.

label	**main object size**	**in-line object size**	**# of in-line objects**
`s+2s`	small	small	2
`s+2m`	small	medium	2
`s+8m`	small	medium	8
`m+2m`	medium	medium	2
`m+8m`	medium	medium	8
`l+8m`	large	medium	8

Table 9: Workloads used in tests.

The request size is always 350 bytes. The request sizes are static in the tests for two reasons: 1) according to the measurements from the statistics, the requests are typically small enough to fit in one segment. 2) We are focusing on the performance of the downlink of the transfer and suspect that the up link will not be a bottleneck in the transfers.

Workload `s+2s` represents a simple query of a page. The page has only two small in-line objects. This is the smallest workload we have in our tests. All TCP connections can be started almost immediately because the total number of object is smaller than our limit of concurrent TCP connections.

Workload `s+2m` has two medium in-line objects instead of small ones and **workload** `s+8m` raises the number of in-line objects to eight. The first modification is to study the significance of the in-line object size with small and medium workloads. The second modification makes the number of competing TCP transfers significantly higher. Full four parallel TCP connections are utilized and after the transfers of the first objects are completed, there are others in queue to start. Starting time can vary quite a lot if some connections suffer from sub optimal performance delaying the start of the subsequent connections.

Workload `m+2m` introduces a medium main object. The sizes and number of in-line objects are identical to the workload `s+2m`. With a larger main object, the in-line objects could finish earlier than the main object. The transfer of main object could suffer for the other transfers and therefore decrease the total performance.

Workload `m+8m` increases the number of in-line objects to eight and uses properties otherwise identical to the fourth download. In this workload there is quite a lot concurrency since the TCP transfer download for the main object should complete after the first three in-line objects. Completing the first three in-line objects enables opening three new TCP connections. They are likely to start at slightly different time, and may experience different network and link conditions.

Workload `l+8m` has a large main object and eight medium in-line objects. The TCP transfers of in-line objects should be completed by the end of the transfer of the main object. The TCP transfers in-line objects may have difficulties because there might not be much bandwidth available when they start. The size of main object should be enough to cause the TCP transfer to move to the connection avoidance phase. Also slow start overshoots could happen when the competing traffic narrows the bandwidth available to the transfer of the main object. Since the TCP connection for the main object lasts longer than for the other objects, the available bandwidth is likely to increase toward the end of the test.

5.4 TCP options

Testing with different TCP enhancements will point out the benefits and possible drawbacks of each enhancement. Table 10 describes the features of baseline and enhanced versions of TCP. Several TCP enhancements are already included in the baseline TCP. These features include Limited Transmit, SACK and TCP Timestamps. Enhanced TCP adds support alternatively for D-SACK and F-RTO and uses a larger Initial Window of four segments.

Next we describe why each of the TCP options was selected to the baseline TCP. Section 3 discusses the enhancements in more detail.

- **Increased Initial Window** [All02] option allows the TCP to start a transfer with higher amount of segments than the conventional TCP. We use an Initial Window of two segments is our baseline TCP. This allows the TCP sender to send 1048 bytes initially, if Maximum Transfer Unit (MTU) of 576 bytes is used. The Initial Window of two segments is widely used and therefore selected in our baseline TCP. An

Implementation	TCP option
Baseline TCP	Increased Initial Window (2 segments) Limited transmit SACK TCP Timestamps (with and without)
Enhanced TCP	Increased Initial Window (4 segments) D-SACK F-RTO

Table 10: TCP enhancements included in our baseline and enhanced TCP implementations.

increased initial window should improve performance of TCP with small transfers, because it notably decreases the number of round trip times needed in TCP transfers with our workload.

- **Limited transmit** [All01] allows the TCP sender to transmit a new segment in response to each of the first two duplicate acknowledgments that arrive. This should avoid some retransmission timeouts when `cwnd` remains low, like with small transfers.
- With **Selective Acknowledgments** [Bla03] the TCP receiver may acknowledge only some of the incoming segments. This gives the TCP sender important information and makes it able to avoid unnecessary retransmissions of those segments which improves the performance. This TCP option is widely used in current TCP implementations.
- Use of **TCP Timestamps option** [Jac92] reduces the Maximum Segment Size available in TCP packets by 12 bytes and reduces the maximum number of SACK blocks to three. The TCP Timestamps option enables the Linux undo mechanism [Sar02a], an Eifel like RTO algorithm which avoids unnecessary retransmissions after spurious retransmission timeouts. The use of TCP Timestamps in wireless networks is recommended in RFC 3481 [Ina03], and thus the option is included in our baseline TCP. To test also with other RTO algorithms, we have a version of baseline TCP with the TCP Timestamps Option disabled.

The following options are used in our enhanced TCP in addition to the options included in the baseline TCP. Each option will be tested and compared to baseline TCP. After analyzing the results of individual enhancements, we test some combinations to be tested together with each other.

- **Increased Initial Window** is set to four segments in our enhanced TCP. With MTU of 576 bytes the Maximum Segment Size (MSS) is 2096 bytes. Increasing Initial Window to four segments could improve the TCP performance because less TCP transmissions are needed to complete a TCP transfer.

- With **D-SACK** [Flo00] the TCP receiver may inform the sender about duplicate segments using SACK blocks. TCP sender uses this information to conclude if it has reduced its congestion control parameters unnecessarily. This information may increase the overall throughput. To use this option we have to disable the TCP Timestamps option in the TCP, because if either TCP Timestamps or D-SACK is enabled, the Linux undo mechanism is used. If both are enabled, the TCP Timestamps option is used.

- **F-RTO** [Sar03] may improve the performance of TCP in cases of sudden delays, lost retransmission, burst losses and packet reordering comparing to conventional TCP. Some tests with SACK enhanced TCP together with F-RTO have yield with good results [Sar02b]. To be able to compare the algorithm we disabled the TCP Timestamps Option in the baseline TCP, which disabled the Linux TCP's Eifel like RTO algorithm, and made us able to compare the F-RTO algorithm to other TCP variants.

5.5 Metrics

The Seawind emulator logs every action that has been made to each packet. It also reports queue status and other events that help analyzing the results and adds an exact time stamp and packet ID to the events. The remote and mobile hosts collect tcpdump logs of the network traffic. With both the tcpdump logs and the Seawind log we can figure out exactly how each packet was affected during the transmission. To be able to get the applications view of the transfers we have also the log created by the traffic generator. Because our main interest is in the TCP protocol's behavior, we do not use this log as a main resource, but as a reference to get a deeper understanding of each test run.

TCP transmission may be evaluated per TCP connection and per *HTTP transaction*. HTTP transaction begins by requesting a main object and ends when the last in-line object is transferred. To be able to measure the performance in both aspects we have to define metrics that can be used through the tests and measure the performance of the results efficiently. In this subsection we define the metrics used in the evaluation of the results and discuss why a particular metric is considered interesting.

In our analysis, we have a number of *classes* which is equal to the total number of

connections in a test. Main objects have their own class, which gives us an easy way to compare the characteristics of TCP transfers of the main objects in different tests. Each in-line object is classified by its throughput: the in-line object with the highest throughput within each HTTP transaction is put to the first class and the in-line object with the lowest throughput to the last class. This is repeated for all the test runs in a replication set. In the end we have all transfers divided to classes based on their throughput and can make calculations independently in the classes if needed.

All metrics except the response time a router queue length will be collected from the HTTP server to get accurate results. We do collect all information both ways, but include information about the client to server traffic only if it is relevant. Next we define the metrics we use in analyzing the results.

Response time of a HTTP transaction is very important. The calculation of response time is done in the client end of the TCP transfer and starts when the first SYN segment is sent and ends when the ACK for the client's FIN segment is received. The measured response time is closely the same time that a user of a browser observes, differing only with the time caused by the transmission of the last FIN-ACK and ACK segments which is typically close to a round trip time.

Elapsed time is calculated for each individual TCP connection. Since the transferred objects are not of the same size, we cannot always compare the elapsed times with each other. In these tests the sizes of in-line objects are same in a workload, however, which gives us an opportunity to compare the elapsed times of in-line objects in a test set. The calculation of elapsed time is done in the client end of the TCP transfer and starts when the first SYN segment is sent and ends when the ACK for the client's FIN segment is received.

Throughput of a TCP transfer is calculated in the server end of a TCP transfer. The throughput is calculated by dividing the size in bytes of the transferred object with the time in seconds which is used in the object's transfer. The transfer time is calculated from the arrival of the client's SYN segment to the sending of the ACK to the client's FIN-ACK segment. There is therefore some additional time in the transfer time. The additional time is typically close to a RTT, because the request is always small enough to fit in one segment. Opposite to elapsed times, throughput can be compared for all TCP transfers regardless of the size of the transferred object. This metric gives us extra information to be used in the evaluation of stability of TCP transfers in a test.

Stability of TCP transfers tells how close the throughput of different TCP transfers inside a test run are to each other. If a throughput of one TCP transfer is considerably

lower than another's, the stability is considered bad. Stability of transfers is important because in all of our test cases we have several concurrent TCP transfers.

Number of dropped packets affects directly to the number of retransmissions and has remarkable effect on TCP behavior. The number of packet drops is calculated inside connection classes. We present the median drops for both congestion and error related drops as well as the sum of maximum packet drops in connection classes. The sum gives a comparison value of worst cases between test results with a workload. The total number of drops in all repetitions could also be used, but the sum value is calculated from values that actually exist in one particular connection and is not smoothed over all repetitions. Together with the median the sum can be used to conclude the distribution of the drops in connections. Additionally the value can be used despite some of the tests would be run with unequal number of repetitions.

The following metrics are not inspected as carefully as the ones above, but are referred during the analysis:

Number of retransmission timeouts can not be measured automatically with our current tools. With `tracelook` and `Seawind` we can however study it manually. In our tests there can be quite long periods of time with no activity as seen in the application level due to the link layer retransmissions. These delays can be seen in TCP trace quite easily, and may be followed by retransmission timeouts. Also lost acknowledgments and packets may cause an RTO.

Number of unnecessary retransmissions[2] is laborious to be counted reliably. We can count the number of retransmitted packets and subtract the number of packet drops from it, but we fail to take in to account the unnecessarily resent packets that are dropped during the retransmission. However, with the help of Seawind logs we can look if a retransmitted packet is dropped and see if the original packet will be delivered, which makes the retransmission of that packet unnecessary. In conventional TCP, retransmission timeouts are sometimes followed by unnecessary retransmitted packets. D-SACK, Linux undo mechanism and F-RTO enhancements may improve the situation notably, which also is being evaluated also in our tests.

Router queue length can be observed in any given time in the Seawind log. The length of the queue is an indication of the congestion in the last-hop router. Even if the queue is not full causing packets to be dropped, the queuing delays the delivery of the

[2] An unnecessary retransmission may happen due to packet reordering or excessive delay in the transmission of a packet from TCP sender to TCP receiver, which makes the TCP retransmission timeout of the sender to expire. If the original packet is eventually delivered, the timer expired in spuriously.

packets and may cause the TCP sender's retransmission timer to expire. The progression of the queue length is observed to see it effects to the TCP sender.

5.6 Discussion

Next we consider the validity of our tests. Because of the emulated network we have made some approximations and may have inaccuracies in the parameters of the model.

Defining the workload was one of the most important things in this study. Even if all the tests were run as planned, the results would be irrelevant if the workload does not conform to reality. To make the workload realistic we studied a number of previous researches and network logs of a real Internet service provider. We believe that the selected workload represents current network activity quite well. Since all our workloads have concurrent connections we are not at risk of making theoretical assumptions of the TCP performance, but have practical workloads which might actually be in use in the Internet. The number of concurrent connections is selected to correspond with typical number of connections used by browsers to one server in HTTP 1.0 traffic. Although some existing browsers make more concurrent connections we feel that the use of the four connections is justified, because the existing browsers act differently to each other and we do not want to limit our tests to any of them.

Our HTTP 1.0 traffic is generated with a tool consisting both WWW server and client. The traffic model therefore deserves to be discussed. Our tool makes a HTTP request for each object in a new connection. The request-response communication is close to a real HTTP client-server communication. Since the transferred object sizes include all header data, the exact communication messages are not relevant. This does not limit the modeling since it is not relevant what the objects contain except if packets are compressed somewhere on their way. In that case some binary in-line objects might compress less than the HTTP headers, but the in-line objects might as well be plain text, for example an XML document. In real world HTTP servers may introduce extra delay in processing a request. These delays are not static and would complex the analysis of TCP behavior, and thus we model a lightly loaded server and focus on protocol performance.

The fact that our main focus lies in HTTP 1.0 traffic leaves space for further research with HTTP 1.1 using request pipelining. Today HTTP 1.1 is not widely used in the Internet, however, mainly because many servers have disabled it and the proxy support is not complete. For these reasons to evaluate the HTTP traffic of today, HTTP 1.0 has to be tested.

We believe that our baseline TCP implementation is the TCP implementation of the near future. In version 2.4.20 of the Linux kernel the majority of bugs and inaccuracies present in earlier versions should already have been fixed. To avoid making incorrect assumptions of the TCP behavior we have used a modified version of kernel in which some features which might make analyzing difficult or are not part of current TCP specifications are disabled. These features include CBI, delayed acknowledgments and in some of the tests, RTO behavior as discussed in 5.1. The result a is well functioning TCP implementation which follows the IETF specifications quite well. To confirm the correct behavior, we analyzed the results carefully to find any implications of incorrect behavior. To understand the results we have to have a good understanding on the TCP and the behavior of the TCP enhancements. Without advanced knowledge we are unable to select relevant enhancements and to draw the correct conclusions.

Our approach to the link layer retransmissions may have some inaccuracies, because we had to make approximations on the retransmission time that is caused by the link layer and do not have any variation on the link layer retransmission time. All retransmissions take 700 ms which is multiplied by the number of retransmissions needed. A static delay per retransmission simplifies the evaluation of protocol behavior remarkably.

During the emulation process the additional delays caused by the Seawind software could cause inaccuracy to our measurements. To ensure that the delays are accurate, we defined an upper limit of 10 ms for the difference between the requested delay and the actual measured delay. In our tests this kind of inaccuracies were very rare. The inaccuracies did not have effect on our test results. The additional overhead caused from the transfer of packets from an end host to the emulator does not have effect to our measurements because the packets are transferred in a private LAN significantly faster than the emulated link.

6 Results

In this section we present the results of our tests and analyze the TCP behavior and performance. This section is divided to optimal link, lossy link with low ARQ persistency, lossy link with medium ARQ persistency and lossy link with high ARQ persistency.

6.1 Optimal link

In this subsection we describe the results tested with optimal link.

6.1.1 Overview of the results

Table 11 summarizes the test results with baseline TCP with TCP Timestamps and with Increased Initial Window of four segments. Table 12 summarizes the tests results with baseline TCP without TCP Timestamps option and table 13 the results with D-SACK and F-RTO tests. The tables have a column for each workload of a TCP variant and measured metrics as their rows. All values except the sum of maximum drops in connection classes (Σ maximum drops) are given as median values. The tables have the following metrics: response time in seconds, throughput of main objects' transfers, the throughput of the slowest and the fastest transfers of in-line objects and sum of maximum packet drops in connection classes. The throughput of main objects' transfers is marked with (m), and the throughput of in-line objects' transfers with (i). Similar tables with the same metrics are reported later for the other test cases. Due to the nature of the link, all packet drops occurred were due to congestion.

Besides in tests with workload `l+8m`, the concurrent transfers were stable. This was because the TCP was unable to fully utilize the available bandwidth because of the small objects sizes. The differences between throughput of in-line objects' transfers resulted from competing TCP transfers. In workloads `s+2s`, `s+8s`, `s+8m`, `m+2m` and `m+8m` the TCP transfers stayed in slow start to the end of the transfers. Tests with workload `s+2m` were similar to the begins of tests with workload `m+2m`. Because there was still packets to be transferred in the main object's transfer, the sender sent the maximum number of segments with workload `m+2m`, while it sent less with workload `s+2m`.

WL	BASELINE + TS						IW4 + TS					
	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	4.50	6.39	15.34	7.05	17.01	23.59	4.01	5.77	13.99	6.60	15.76	21.80
Med thro. (m) B/s	1635	1578	1478	2262	2031	3931	1849	1859	1709	2467	2157	3688
Slowest thro. (i) B/s	900	1897	1725	1649	1361	730	1105	2202	1642	1808	1440	618
Fastest thro. (i) B/s	902	1935	1803	1685	1884	1908	1286	2494	2053	1996	2117	1396
Drops (c) median	0	0	0	0	0	16	0	0	0	0	0	2
Σ maximum drops (c)	0	0	0	0	0	19	0	0	0	0	0	3

Table 11: Summary of the optimal results of baseline TCP and TCP with Increased Initial Window of 4 packets.

WL	BASELINE - TS					
	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time (s)	4.47	6.31	15.05	6.93	16.72	22.22
Med thro. (m) B/s	1659	1597	1496	2282	2046	3809
Slowest thro. (i) B/s	905	2016	1535	1685	1392	608
Fastest thro. (i) B/s	905	1929	1833	1753	1922	1869
Drops (c) median	0	0	0	0	0	18
Σ maximum drops (c)	0	0	0	0	0	20

Table 12: Summary of the optimal results of baseline TCP without TCP Timestamps.

WL	D-SACK						F-RTO					
	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	4.47	6.30	15.05	6.93	16.72	22.21	4.47	6.31	15.05	6.93	16.71	22.21
Med thro. (m) B/s	1659	1597	1496	2282	2046	3809	1659	1597	1496	2281	2045	3811
Slowest thro. (i) B/s	904	1929	1535	1685	1392	609	903	1929	1535	1685	1392	609
Fastest thro. (i) B/s	905	2016	1833	1753	1922	1869	905	2016	1833	1753	1922	1869
Drops (c) median	0	0	0	0	0	18	0	0	0	0	0	18
Σ maximum drops (c)	0	0	0	0	0	20	0	0	0	0	0	20

Table 13: Summary of the optimal results of D-SACK and F-RTO enhancements.

6.1.2 Baseline TCP with Timestamps

In tests with two in-line objects there was not much difference in maximum and minimum throughput in TCP transfers of objects. In tests with eight in-line objects the difference resulted from competing traffic. With workloads `s+8m` and `m+8m` the last in-line object was transferred alone, which made that transfer faster than the others. Only minor differences

were found in the thirty replications of the test.

The router queue length was at most four units in the first four cases, and at most 10 in tests with workload `m+8m`. In the tests the queue got its highest value typically when several concurrent TCP transfers were completing. This is obvious because at that point the congestion windows were as large as they get in the transmissions, and the cumulative throughput of concurrent transfers was higher.

In tests with **workload** `m+2m` the begins of the main objects' transfers were identical to workload `s+2m` because the both had two in-line objects of the same size. The differences began after the TCP transfer of the small main object would have ended. With a main object from workload `s+2m` the TCP transfer ended by sending two packets. With a main object from workload `m+2m` the TCP sent the maximum three packets allowed by its congestion window. The transfer continued in slow-start, and because the transfer had started first, its congestion window was highest allowing it to transmit packets faster than the competing TCP transfers. Because of this the TCP transfer of main object completed before the transfers of the smaller in-line objects.

In **workload** `m+8m` the medium main object delayed the beginning of the fourth in-line object's TCP transfer. The transfer of the main object completed almost at the same time than the transfers of the first three in-line objects. The last transfer which proceeded without competing traffic began over two seconds later than with workload `s+8m`. The last request was made when the other TCP transfers were completing, and the downlink was unused the time the request took.

Workload `l+8m` had enough data to cause congestion related drops at the last-hop router. Figure 3 illustrates the queue length at the last-hop router. The TCP barely avoids congestion drops when 12 seconds have passed from the start. At that point the transfer of the first three in-line objects were completed which freed up the bandwidth. When the subsequent TCP transfers began, the queue quickly filled up causing packet drops in all concurrent transfers.

In the transfer of the main object several packets were dropped for slow-start overshoot. Figure 4 depicts the transfer of the main object and figure 5 the transfers of three in-line objects at the time the router queue filled up. In the figures dropped packets are marked with an 'x'. Next we describe the TCP behavior in the figures.

After the first packet is dropped from the main object's transfer, TCP receiver sends three duplicate acknowledgments to the server which triggers the fast retransmit. Because the congestion window is halved the server cannot continue sending data to the client before enough acknowledgments have arrived. As soon as this has happened the

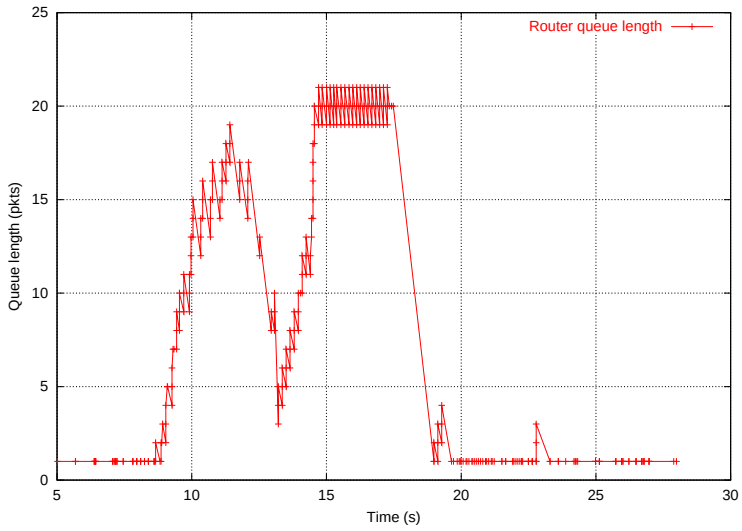

Figure 3: Queue length at the last-hop router during TCP transfers of workload `1+8m`.

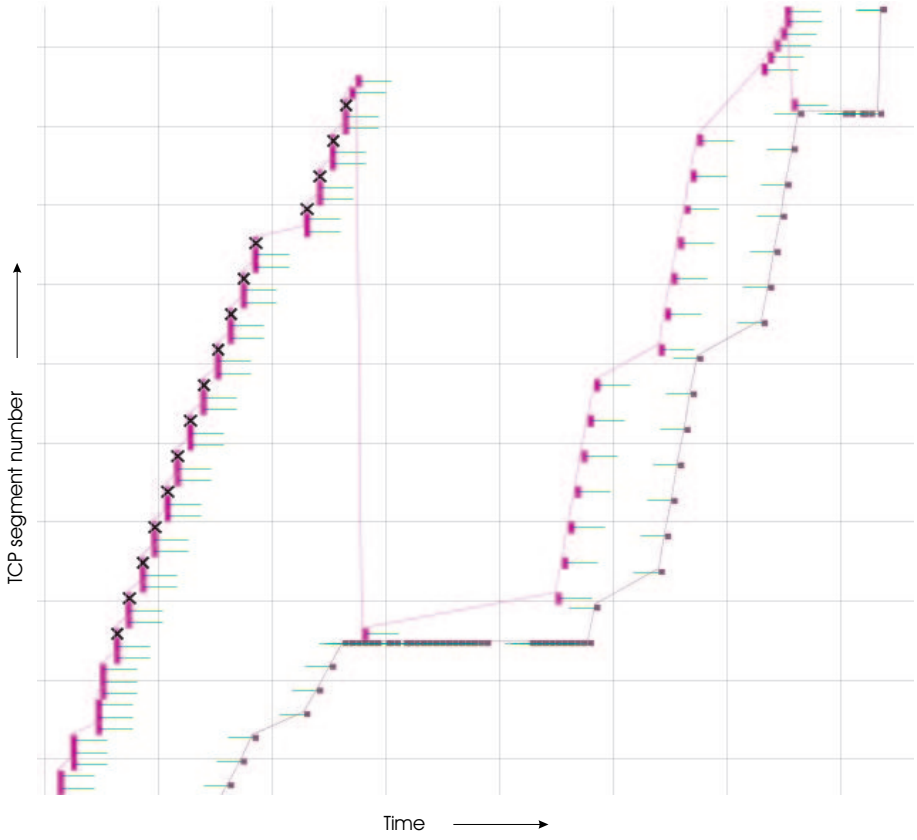

Figure 4: Slow-start overshoot in the transfer of the main object during workload `1+8m`.

TCP recovers effectively using SACK information to the recovery point. The last dropped

packet is not retransmitted immediately but new data is transmitted before the retransmission. This is because Linux TCP sender cannot conclude if a packet is lost or if packets are reordered before it has SACK information of at least three packets with higher sequence numbers. This behavior is specified in RFC 3517 [Bla03]. It causes another three duplicate acknowledgments sent by the client, but the packet is retransmitted before they arrive using SACK information because there are no other packets left to be transferred.

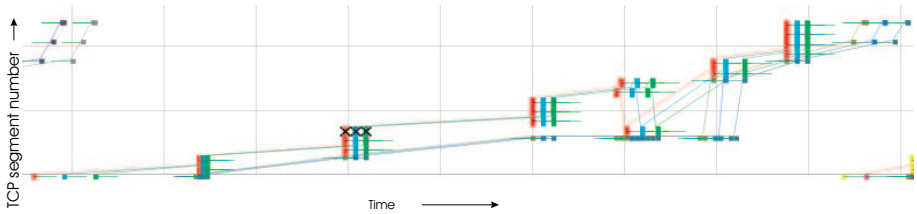

Figure 5: Fast retransmits of the three in-line images concurrent with the overshooting transfer of main object during workload `l+8m`.

The three in-line objects in figure 5 suffered from one packet drop each. Each TCP sender received three duplicate acknowledgments from the TCP receivers and recovered with fast retransmit. Stability between TCP transfers was not good: some TCP transfers suffered much more from concurrent traffic than others. In figure 5 the transfers of in-line objects are much slower compared to the main object if figure 4. The transfers are slower because the transfers have just started, but also because of the additional delay caused by the queue.

6.1.3 Initial Window of 4 packets

The performance increased notably in all tests compared to the results baseline TCP using TCP Timestamps with TCP using an Initial Window of four segments. Table 14 summarizes the decrease in response times with different workload. The main reason for the improvement is that the TCP sender needed one RTT less to send the objects than with Initial Window of two segments. The small in-line objects can be transferred in one RTT because they are small enough to fit in four payloads.

With **workloads** `s+2m` and `s+8m` the last in-line object was transferred partly alone. With medium or large main objects this did not happen. In tests with 8 in-line objects the limit of concurrent transfers delayed the beginnings of new transfers of in-line objects, and thus progress of the first in-line object transfers were very important for the response time.

With Initial Window of four segments the TCP increased its congestion window faster

Workload	Improvement
s+2s	10.9%
s+2m	9.7%
s+8m	8.8%
m+2m	6.4%
m+8m	7.3%
l+8m	7.6%

Table 14: Improvement in response times of tests with IW4 compared to the baseline TCP with TCP Timestamps.

which affected also to the queue length at the last-hop router. In tests besides with the last workload there was typically more queue at the last-hop router than with baseline TCP with TCP Timestamps. The length of the queue was at most 13 packets with workloads other than `l+8m`.

In tests with **workload** `m+8m` the TCP transfers of main object and first three in-line objects were completed almost the same time. Due to the almost full queue at the last-hop router, opening a new TCP connection and requesting a new in-line object were slower when the transfers of in-line objects still proceeded than after they had finished. This made the four new TCP transfers to begin at the same time, which affected to their throughput and delayed the start of the last in-line object's transfer.

In tests with workload `l+8m` only three packets were dropped due to congestion, while there were 19 packets dropped in tests with baseline TCP with TCP Timestamps. Median throughput of main objects as well as median throughput of in-line objects in table 11 were lower than with baseline TCP with TCP Timestamps, but the response time has decreased, however.

Studying the TCP transfers of the main objects revealed that the slow-start overshoot did not cause nearly as many packet drops with Initial Window of 4 segments than with 2 segments. This was because when all concurrent transfers initiate with bigger congestion windows, congestion develops sooner at the last-hop router. The sizes of congestion windows of the TCP transfers were lower and thus only a few packets were dropped.

The first dropped packet was detected for three duplicate acknowledgments sent by the client. With the same acknowledgments the client notified about the second dropped packed with SACK block and both packets were retransmitted. The server continued with previously unsent packets and no packets were retransmitted unnecessarily. The packet drops moved the TCP from slow-start phase to congestion avoidance.

With baseline TCP with TCP Timestamps, the sum of maximum packet drops in transfers of in-line objects was three. Because no individual transfer rate was as high, less packet drops occurred overall. With IW4 only one packet was dropped in in-line objects' transfers. The packet that was dropped, however, was crucial to the response time, because it was the FIN segment of the third in-line objects transfer. If a FIN segment is dropped, the only way to recover is to wait for RTO to expire. In one of our tests it took 7.72 seconds before the segment was retransmitted during which the client was unable to open new connections. Because the transfer of the main object still continued, the client opened two new connections for the next in-line objects. These transfers were completed at the time the retransmission was completed. Stability between TCP transfers with workload `l+8m` and IW4 was excellent compared to the tests with baseline TCP with Timestamps. The minimum throughput of 616 bps of an in-line object resulted from the dropped FIN segment.

6.1.4 Baseline TCP without Timestamps

Because no losses occurred on the wireless link, the improvement in response time compared to the results with baseline TCP with TCP Timestamps resulted from the additional overhead caused by the TCP Timestamps. Because the Timestamps option uses 12 bytes of the MSS, the amount of improvement in the response time depends on the total number of packets in the workload. In transfer of the main object in workload `l+8m` the TCP transfer can be completed with three packets less than when TCP Timestamps option is in use. With other workloads the number of packets needed in TCP transfer was equal in both cases, but the payload used in the last packet was smaller when TCP Timestamps were not used. This results in different transmission time for the last segment of the TCP transfers.

6.1.5 D-SACK and F-RTO

Table 13 summarizes the results of optimal case tests with D-SACK and F-RTO enhanced TCP. Comparing the values to the baseline TCP without TCP Timestamps shows that the values are very close. Also the traces shown by the visualization tools were similar. In this test case there are no RTO based retransmissions, and thus the performance is unaffected and close to the performance of baseline TCP without TCP Timestamps.

6.2 Lossy link with low ARQ persistency

In this subsection we present the test results of a lossy link with low ARQ persistency.

6.2.1 Overview of the results

Table 15 summarizes the test results with baseline TCP using TCP Timestamps and the results of tests with Increased Initial Window of four segments. Table 16 summarizes the results of baseline TCP without TCP Timestamps and results of F-RTO tests. The same metrics are reported as for the optimal link case.

	BASELINE + TS						IW4 + TS					
WL	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	6.45	8.82	20.13	10.73	22.88	34.98	4.72	8.54	18.97	8.60	20.19	34.17
Med thro. (m) B/s	1208	1256	1271	1614	1559	2231	1552	1540	996	2169	1597	2223
Slowest thro. (i) B/s	619	1326	786	1070	681	530	1105	1415	709	1466	713	539
Fastest thro. (i) B/s	693	1470	1695	1400	1715	1482	1286	1888	2029	1753	2135	1982
Drops (c) median	0	0	0	0	0	0	0	0	0	0	0	0
Drops (e) median	0	0	2	0	2	6	0	1	2	0	2	7
Σ maximum drops	11	14	47	19	49	89	12	20	47	20	49	84

Table 15: Summary of the lossy link with low ARQ persistency test results of baseline TCP and TCP with Increased Initial Window of 4 packets.

	BASELINE - TS						F-RTO					
WL	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	6.70	9.00	21.85	10.66	20.90	32.13	6.59	10.18	20.47	9.13	21.56	36.96
Med thro. (m)	1357	1355	1176	1733	1534	2489	1211	1346	1049	1848	1623	2028
Slowest thro. (i)	694	1206	712	1284	705	522	694	1043	708	1260	1624	581
Fastest thro. (i)	742	1625	1676	1529	1768	1593	728	1686	1706	1543	676	1642
Drops (c) median	0	0	0	0	0	0	0	0	0	0	0	0
Drops (e) median	0	0	2	0	0	5	0	1	1	0	2	6
Σ maximum drops	14	15	50	16	49	100	14	14	42	19	50	86

Table 16: Summary of the lossy link with low ARQ persistency test results of F-RTO enhanced TCP and baseline TCP with TCP Timestamps.

Because the response times for tests with workloads `s+8m`, `m+8m` and `l+8m` were considerably longer than the others, several changes between good and bad states took place in one test. In those tests a connection with high elapsed time caused severe increment in

the response time because it delayed the starts of subsequent TCP connections. If packet losses occurred during the first transfers, it affected the results significantly. When there were only two to four connections left, the response time was not increased as much. Delayed packet and packet losses occurred to the last TCP connection can be added to the response time almost directly. The total number of objects was not, however, the worst possible in tests with eight in-line objects because the number was not a multiplicative of four. If no problems occurred with the first transfers, the last transfer was almost all the time alone. If one connection suffered from errors the response time was not necessarily increased much: two TCP transfers just took place concurrently instead of one. On the other hand if the bad state occurred during the last connection the response time was increased remarkably.

All packet drops were error related except in tests with workload `1+8m`. The recovery from packet losses was generally efficient with the help of SACK information. Stability between TCP transfers was not very good. Due to the different number and length of good and bad states, different test runs had very different network conditions. More replications would be needed to be able to make statistic analyses of results.

6.2.2 Baseline TCP with TCP Timestamps

In all test cases the performance decreased notably from the optimal test results. The response time was 30-55% higher and the throughput of both main objects' and in-line objects' transfers decreased notably. The router queue length was almost same than with optimal results for the first five workloads in which the length of the queue was at most 14 units. In all test cases multiple packets were dropped. A bad state affected differently to the TCP transfers depending on its timing. Next we discuss three different cases: when a bad state occurred in the begin of a test, in the middle of a test or in the end of a test.

- **Bad state in begin of a test** lengthened the TCP handshake and delayed the requesting of in-line objects. If the acknowledgment of the first data packet was delayed, the response time increased at least 700 ms because no other packets can be sent nor connections can be made at the time. In tests with multiple in-line objects the delaying of one of the first TCP transfers had serious effect in response time in some cases.

  When the client requested a main object, the server side TCP typically acknowledged the packet of the request and transmitted the first packets of the main object immediately. If the acknowledgment was lost, however, the RTO triggered for the request packet, and it was retransmitted. The server then had to retransmit the

first packets unnecessarily.

With workload `s+2m` it took 6.4 seconds from the initial request before the first data packet was correctly acknowledged. Figure 6 depicts this behavior. In the figure delays are marked with a horizontal line with following color mapping: blue for transmission delay, green for propagation delay and red for error delay. The test case began with a bad state which was followed by a short good state. During the good state no packets were transmitted before another bad state began. The second bad state ended at 4.4 seconds from the start. In the figure the TCP sender (the WWW server) sends first two data packets of the main object after receiving the request. Both packets are lost, and first packet is retransmitted due to an RTO. The packet is received successfully by the TCP receiver which requests two in-line objects. The acknowledgment for the first packet of the main object is lost, however, and after another RTO the packet is retransmitted again. This time the acknowledgment for the packet is received by the TCP sender.

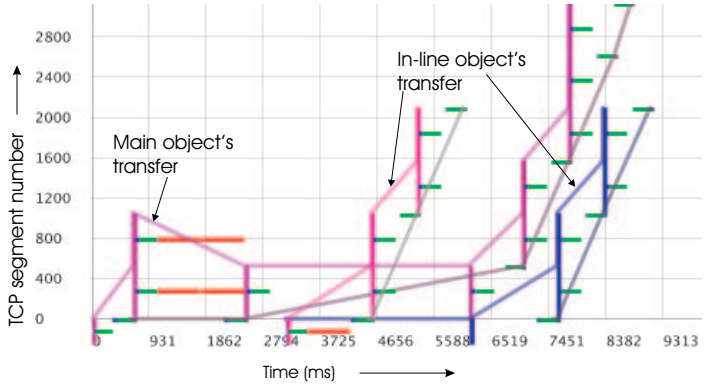

Figure 6: Bad state in the beginning of a test with workload `s+2s`.

- **Bad state in the middle of a test** caused RTO to be triggered if data packets or acknowledgments were lost or delayed with workload `s+2s` in many cases. Fast retransmit was not typically triggered. Because total of four packets were sent in a transfer of a small in-line object, there was not enough acknowledgments to trigger the fast retransmit algorithm and all recoveries from packet drops were done with RTO expirations. In main objects' transfers a bad state caused also lost acknowledgments, and one or more of the three duplicate acknowledgments was usually lost. This caused RTOs for the data packets whose acknowledgment was lost, and unnecessary retransmissions of those packets. If an RTO triggered in the middle of a test with eight in-line objects there were typically several concurrent transfers taking place. Each transfer might experience the delays or drops and thus multiple unnecessary retransmissions might occur. Some of the retransmissions could

have been avoided with more convenient RTO estimator, but that would not have behaved well in case of actual packet loss.

With other workloads the additional delays caused by link layer retransmissions were not long enough to cause spurious retransmission timeouts. The packets were delayed but the transfers were able to continue normally. Because the subsequent packets were stored in the link buffer to prevent reordering, acknowledgments were delivered in bursts. If the link layer retransmission of a data packet failed and a packet was lost, the TCP recovery was handled using fast recovery which was not the case with workload `s+2s`. A lost acknowledgment caused RTO to be triggered in TCP transfers of small and medium main objects as well as in-line objects, and also in the begin of transfers of large main objects. In an example case shown in figure 7 acknowledgments are lost which causes a retransmission timeout. After the packet is retransmitted, the TCP receiver acknowledges all packets to the recovery point. With TCP Timestamps information the TCP sender is able to conclude that the retransmission was unnecessary and undo the congestion window adjustments. The TCP transfer continues in slow-start.

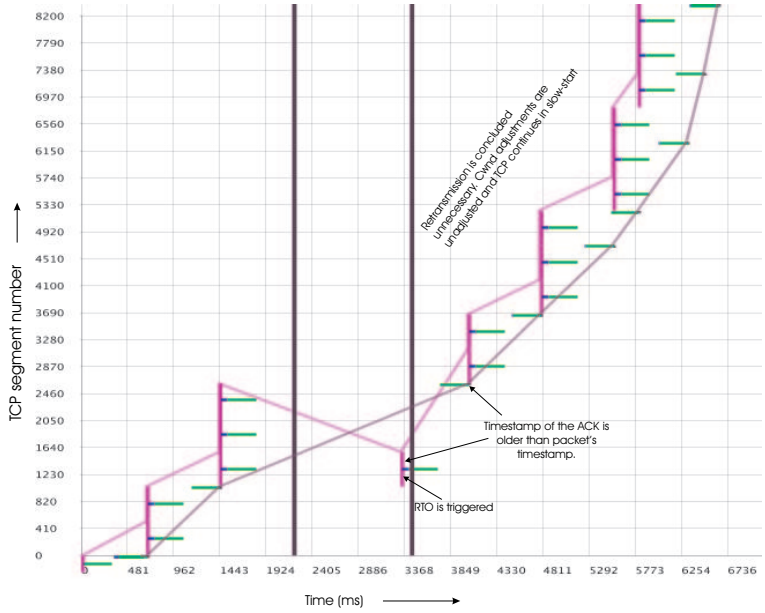

Figure 7: Recovery from an RTO using TCP Timestamps.

- **Bad state in the end of a test** caused an RTO for a data packet if only some packets were left to be transferred or if an acknowledgment was lost. If enough acknowledgments were received, fast recovery was used. If a bad state caused loss of an acknowledgment of the server's FIN segment, the server had to recover with a retransmission timeout. This caused a delay of about four seconds even with

the small workloads. Link layer retransmissions caused also additional delays. In some cases both last data segment and the last acknowledgment were delayed, which caused additional delay of about 1.4 seconds.

With **workload** `s+2m` we had several cases in which the acknowledgments were dropped and packets were resent via RTO. In some cases both the data packet and its acknowledgment were dropped but in most of the cases the retransmission was not needed. Acknowledgments for subsequent packets would have acknowledged also the preceding packets, but due to the object sizes there were often not enough packets left to be transferred. The use of TCP Timestamps did not improve the recovery in those cases.

Figure 8 shows a situation where RTO has been triggered. In the figure delays are marked with horizontal lines and state changes with vertical green lines. The pink TCP transfer suffered a packet loss for the third before last packet. At the same time some acknowledgments were dropped which prevented the fast retransmission of that packet. TCP sender's RTO estimator expired, and the packet was retransmitted. TCP receiver instantly sent FIN-ACK segment which acknowledged also all outstanding packets. The retransmission of the packet took place 3.7 seconds later than the original transmission.

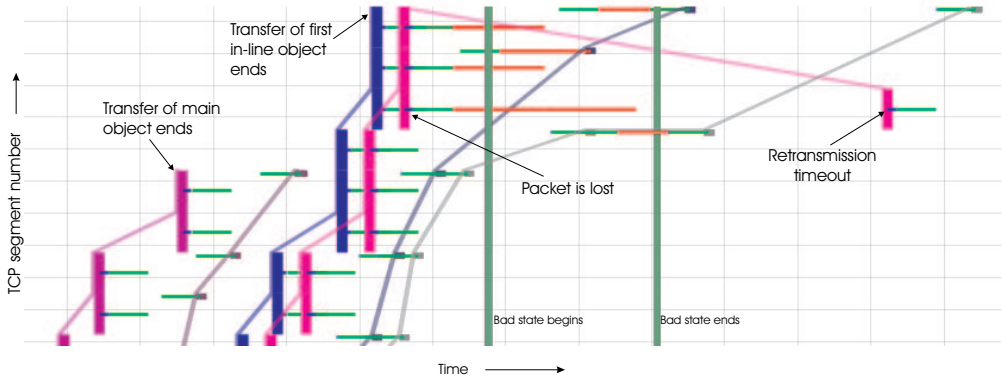

Figure 8: Bad state in the end of a test with workload `s+2m`.

In tests with **workload** `s+8m` median of two packets were lost in the slowest connection class for in-line objects. The sum of maximum packet drops in connection classes was 47. One of the most important reasons for increased response times compared to the optimal case was the limit in concurrent connections. For example in one of the test runs the last packet of the second in-line object was dropped. The TCP receiver acknowledged the packet before last packet and did not get any new packets which would have caused more acknowledgments to be sent. RTO was triggered after 5.7 seconds and the TCP sender retransmitted the packet. All this time the HTTP client had one less efficient TCP connection.

The length of this test case allowed multiple bad states in a test run, which reduced the performance of TCP seriously. Figure 9 illustrates TCP transfer of one in-line object. The transfer began with a bad state. Fourth and sixth packets were dropped and the fourth was retransmitted after an RTO. A duplicate acknowledgment for the third packet was received shortly after this, which SACKed also the fourth packet. The acknowledgment allowed the TCP sender to transmit a new packet.

The receiver acknowledged the fifth packet and shortly after this the seventh packet. The sender continued first with three new packets which all suffered from errors, and then with one additional packet. The link managed to retransmit the third new packet but failed with the other two. The receiver sent a duplicate acknowledgment for out-of-order packet, which made the sender able to send one more packet. At this point an RTO expired for the sixth packet and it was resent. A good state lasting to the end of the connection also began at this point. With the help of SACK information the sender was able to send only dropped or new packets and recovered from the packet losses.

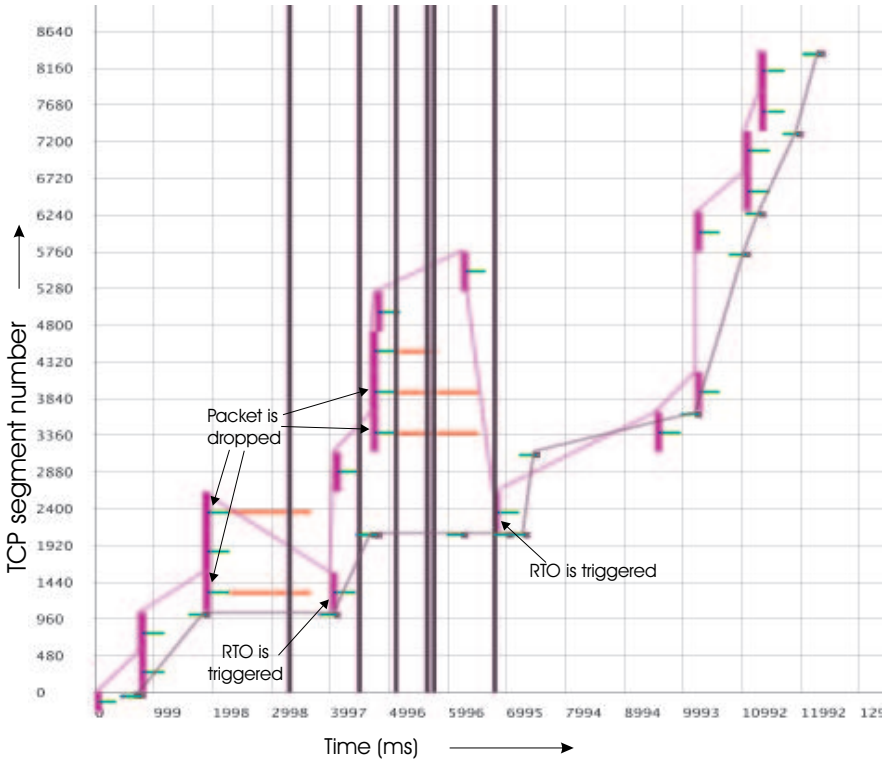

Figure 9: Multiple bad states during transmission of an in-line object with workload `s+8m`.

With **workload** `m+2m` the response time increased 52.2% from the 7.05 seconds of optimal case to 10.73 seconds. The sum of maximum packet drops in connection classes was 19 packets but the median of packet drops was 0 for all connection classes. The

difference in throughput between the slowest and fastest connection classes resulted from different network conditions. For example one test case had three retransmission timeouts in the transfer of an in-line object before successfully retransmitting the last dropped packet.

With **workload** `m+8m` the response time increased 34.5% from the optimal case results to 22.88 seconds. The sum of maximum packet drops in connection classes was 49, which is close to the tests with workload `s+8m`. All packets were dropped due to error. The slowest connection class had a median of 2 error related packet drops in both cases. Enlarging the main object size to medium increases the response time 2.75 seconds. With concurrent traffic present, that is not much for the transfer of 6 kilobytes with our link, because the additional time spent in main object's transfer also delays the start of other connections.

If a connection experienced a packet loss, the recovery could be slow because the packets had to wait in the router queue, which was at most 12 segments of length in this test. This caused some additional RTOs in the tests, which decreased the performance of an individual connection more.

With **workload** `l+8m` there was also congestion related losses. The test runs in which congestion was present were not typical, however: the median of packet drops was 0. Error related losses were more common: the sum over maximum number of drops in connection classes was 89 and all drops were due to error. The transfers of main objects had a median of 6 error related drops. TCP transfers in the slowest connection class of in-line object transfers had a median of 2 drops each. The median response time was 34.98 seconds which is 48.3% more than in the optimal test. If no errors occurred at all, the stability could not be considered good. If a bad state affected to the main objects transfer in the begin of the TCP connection, congestion did not occur at the last-hop router. In that case the connections were quite stable.

Congestion related losses occurred due to slow-start overshoot of the main object, if no packets were dropped in the TCP transfer before that. If no packets were dropped at all in the begin of the test, the results were similar to the optimal case. With delays present the overshooting differed from the optimal case. If acknowledgments were delayed, they could arrive to the sending TCP almost simultaneously. For example one of the cases had a burst of six acknowledgments which acknowledged two packets each. The sender was allowed to send 3 packets per ACK (total 18 packets) due to the slow-start phase. Time between packets sent for each acknowledgment was 5 ms. For this reason the time between the first and the last packets was only about 30 ms, which seems quite small time in our network environment. In our tests the last two packets were dropped due to congestion.

6.2.3 Initial Window of 4 packets

Increasing Initial Window to four segments improved the response time in all tests. In addition to saving RTTs and having less congestion like discussed in analysis of optimal link, the probability for a connection to experience a bad state was lower because less round trip times are needed for a TCP transfer.

In all test cases multiple packets were dropped. The recovery from packet losses was efficient because with SACK information the unnecessary retransmissions of packets were avoided. Because the initial window was increased, several consecutive packets were affected more often by an error than with the baseline case. However, with the help of link level retransmissions successive packets were seldom dropped but just delayed, which improved the recovery phase significantly in some cases.

Lost acknowledgments caused often an RTO in transfers of small and medium objects. Table 17 summarizes the amount of improvement in response times compared to the baseline TCP with TCP Timestamps. The amount of improvement varies quite a lot in the test cases, while it was more stable in the optimal case.

Workload	Improvement
s+2s	26.8%
s+2m	3.2%
s+8m	5.8%
m+2m	19.9%
m+8m	11.8%
l+8m	2.3%

Table 17: Improvement in response time with different workload compared to the baseline TCP with TCP Timestamps.

The higher initial window did not increase the queue length at the last-hop router remarkably compared to the baseline TCP with TCP Timestamps. Tests cases in which congestion was not experienced the router queue length was typically close to the length in the baseline tests. The increased congestion window caused the queue to fill up quicker, however.

The response time was increased notably with **workload** `s+2s`. With this workload the TCP transfer of in-line objects took only one RTT, while it took two RTTs with initial window of two segments. Many of the TCP transfers were not affected at all by a bad state. Delay in transfers did not affect other transfers as only two in-line objects were present. Lost packets were retransmitted using the fast retransmit algorithm instead

for the expiration of RTO estimator like in baseline TCP, because the RTO estimator increased faster than with the baseline TCP with Timestamps.

In tests with **workload** `s+2m` the response time was 17.7% longer than with IW4 enhanced TCP in the optimal case but only 3.2% seconds better than with baseline TCP with TCP Timestamps. The limited increment in performance can be explained with higher number of packet losses caused by bad states in these tests compared to the baseline tests. In this test case we had a median of one error drop per connection in the slowest connection class, and the sum over maximum number of packet drops was 20 packets which is 6 packets more than with the baseline tests.

In tests with **workload** `s+8m` the median response time decreased 5.8% to 18.97 seconds compared to the baseline TCP with Timestamps. The sum over maximum number of packet drops was equal in baseline TCP and TCP with Initial Window of four segments. Also median drops was equal in the connection classes. This helped us comparing the results, but because the states had very different effect to the TCP transfers in different places, the traces were also inspected carefully. Compared to the baseline, the TCP was able to recover from packet losses more efficiently. Fast retransmit was more often in use, because it was useful also in the begin of the transfers. In many of these test runs lost acknowledgments caused the expiration of RTO. For example in one of the test runs the acknowledgment of the first data packet from server to client was dropped and had to be retransmitted after expiration of RTO. Even though two of the other packets were transferred successfully, the client had not transferred enough of the main object to start the transfers of in-line objects (and not even the headers of the HTTP transfer) and other TCP transfers were started not before 6.8 seconds from the initial request.

The improvement in response time compared to the results with baseline TCP with TCP Timestamps was quite high with **workload** `m+2m`. The response time was increased only 0.22 seconds from the response time of workload `s+2m`. This was not due to the excellent performance of TCP with this workload but merely due to the greater number of packet losses we had with workload `s+2m`. The sum over maximum number of packet drops was 20 packets with both workloads, but the median error rate was 1 with `s+2m` while it was 0 with this workload, which affected also to the medians of response times. In these tests we had also cases with multiple packet losses in a window. Those recoveries took quite a long time, because the TCP was only able to send one new packet per received acknowledgment. We had also several RTOs for the same packet in some test cases in the end of a TCP transfer. These cases were not common though, and did not have much effect to the median throughput. No packets were retransmitted spuriously.

With **workload** `m+8m` the response time was improved 11.8% compared to the base-

line TCP with TCP Timestamps. In the tests RTO was triggered quite often, usually several times in a test. We had both necessary an unnecessary retransmissions of packets. The main reason for unnecessarily retransmitting a packet was a bad state resulting acknowledgments to be dropped. If a main object was transferred without errors or had only delays, the TCP transfers of the rest of the objects were similar to the case with workload `s+8m`. To find behaviors unique to this workload and link we focused to the main objects' transfers and their consequences to the other transfers. The transfer of the last six kilobytes did not differ with the workload `s+8m` even if the TCP transfer of a main object lasted almost the whole test run. The good and bad states were in more important role making the response time just slightly higher than with workload `s+8m`.

In tests with **workload** `l+8m` the response time improved 2.3% compared to the baseline TCP with TCP Timestamps. In these tests a maximum of 19 congestion related drops in the transfers of main objects and 3 in transfers of in-line objects. The median of congestion related drops was 0, which means that cases in which congestion happened were not common. Compared to IW4 tests with optimal link, the situation changed in two ways: firstly the router queue filled up more quickly in some cases because the other TCP transfers suffered from packet losses. This made the slow-start overshoot occur later like in tests with optimal link and baseline TCP with TCP Timestamps. Secondly, the link layer retransmissions caused more congestion at-the last hop router because the subsequent packets had to be stored during a retransmission attempt. Typically a packet loss ended the slow-start period of a main object before congestion caused packet drops. The length of the queue stayed most of the time under 15 units, but the limit of 20 units was exceeded several times.

The stability of TCP transfers varied in the tests. With the test runs in which slow-start overshoot happened, stability was poor like with optimal link baseline TCP tests with this workload. The transfers other than main object hardly managed to transmit packets, but still suffered from congestion drops. In the cases where congestion was not experienced stability was better.

6.2.4 Baseline TCP without TCP Timestamps

The results from test using baseline TCP without the TCP Timestamps option did not differ remarkably from the results with baseline TCP with TCP Timestamps enabled. Although we had multiple unnecessary retransmissions of packets, they were generally not due to spurious retransmission timeout. Some data packets were retransmitted unnecessarily due to a lost acknowledgment, but typically the next acknowledgment cumulatively acknowledged all unacknowledged packets and no other packets were retransmitted un-

necessarily. Figure 10 depicts a test run in which lost packet is retransmitted due to RTO. The next acknowledgment acknowledges all in-flight data and unnecessary retransmissions are avoided.

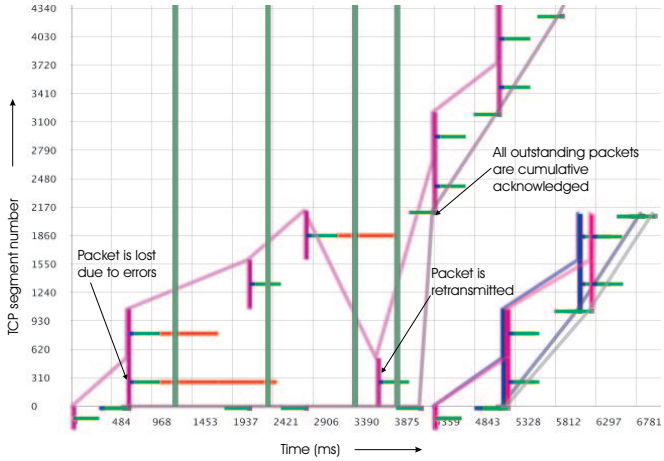

Figure 10: Recovery from an RTO with baseline TCP without TCP Timestamps.

In tests with **workload** `1+8m` the difference between minimum and maximum response times was very high compared to the baseline TCP with TCP Timestamps. The minimum response time was 24.36 seconds and maximum 187.78 seconds. Analyzing the TCP traces revealed, that in one test run the last two packets were dropped multiple times, and retransmitted after expiration of RTO. For this case the transfer of the main object took 187.78 seconds. This test run took more time than others, and several bad states took place during many connections is the test. The median response times were close to each other. With one retransmission the link layer often failed to retransmit a lost packet, and the TCP had to recover from a packet loss. The median response times were close to each other. The median of error related packet drops was 5 in this test case, while the sum of maximum packet drops in connection classes was 100. This means that very different network conditions were present during the test runs.

6.2.5 Tests with F-RTO

Because there was only a few RTO related recoveries, the TCP transfers did not generally benefit from the use of the F-RTO algorithm. Therefore the response time was not improved for the F-RTO algorithm compared to the baseline TCP without TCP Timestamps. If similar test runs are compared, the performance was similar to the results with baseline TCP without TCP Timestamps.

In the retransmission timeouts that happened due to packet losses in our tests, the

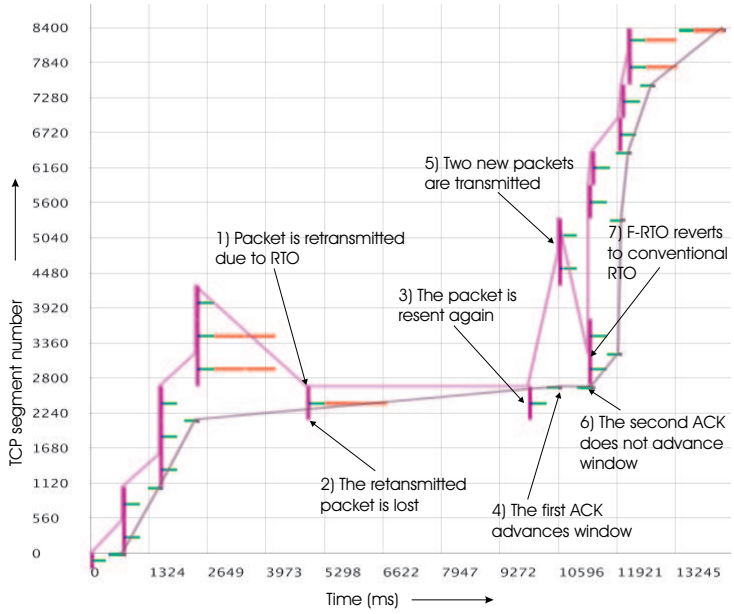

Figure 11: Recovery from an RTO using the F-RTO algorithm.

first ACK after the retransmission acknowledged typically all in-flight packets and the conventional retransmission algorithm would not have retransmitted more unnecessary packets than F-RTO enhanced TCP. The readjustment of congestion window did not improve the performance in our tests because of the small transfers. The fact that F-RTO continues in congestion avoidance after concluding a retransmission spurious might cause loss of performance with our workload, because the TCP was typically in slow-start phase for the whole TCP transfers if there were no difficulties experienced. However, in our tests the transfers typically ended after the first two retransmissions and the congestion avoidance would not cause more RTTs in the TCP transfers. Because the fast retransmit algorithm was often used for packets losses, many of the TCP transfers proceeded in congestion avoidance anyway.

Figure 11 depicts a transfer in which F-RTO was used to recover from packet losses which resulted in retransmission timeout. After the first acknowledgment, two new segments are sent. Because the subsequent acknowledgment does not advance the window, the F-RTO algorithm concludes that the retransmission was not spurious and reverts back to the conventional RTO algorithm.

6.3 Lossy link with medium ARQ persistency

In this subsection we present the test results of a link capable of two retransmissions.

6.3.1 Overview of the results

Both D-SACK and F-RTO enhancements are used to detect unnecessary retransmissions and recover from them with improved performance. With this link type there were only a very limited number of unnecessary retransmission, which were recovered efficiently using SACK and Linux undo mechanism together with TCP Timestamps. Therefore we did not run tests with D-SACK or F-RTO enhanced TCP with this link type. Table 18 summarizes the test results with baseline TCP with TCP Timestamps and with Increased Initial Window of four segments. The same metrics are reported as for the previous cases.

	BASELINE + TS						**IW4 + TS**					
WL	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	5.90	8.44	20.16	8.61	20.57	29.72	4.80	6.87	17.13	7.24	18.86	26.48
Med thro. (m) B/s	1196	1169	1113	1804	1804	2977	1453	1458	1200	2031	1645	3072
Slowest thro. B/s (i)	575	1438	1027	1315	969	516	809	1588	1118	1448	924	526
Fastest thro. B/s (i)	669	1472	1606	1365	1554	1311	1283	1742	1836	1644	1799	1475
Drops (c) median	0	0	0	0	0	15	0	0	0	0	0	2
Drops (e) median	0	0	0	0	0	0	0	0	0	0	0	0
Σ maximum drops	7	7	23	8	20	53	6	6	20	5	21	56

Table 18: Summary of twice retransmitting link test results of baseline and IW4 enhanced TCP.

In tests with lossy link with medium ARQ persistency, the stability between TCP transfers was improved compared to the results with lossy link with low ARQ persistency. Because the number of bad states varied in TCP transfers, the link layer retransmission had an important role on stability. With medium ARQ persistency the probability of a packet loss was lower than with low ARQ persistency, which made the influence of a bad state smaller to response times.

Besides with workload `l+8m` congestion did not cause packet drops. In some test cases the queue was longer at the last-hop router than with the previous link types. The queue length at the last hop router was typically no longer than 10 units in a test run. The throughput of TCP transfers was typically closer to each other than with the once retransmitting link. In all tests the sum of maximum drops in connection classes was reduced compared to the once retransmitting link. With two retransmissions, a bad state does not decrease the performance as much as with only one retransmission. Different luck in network conditions therefore is less important than with the once retransmitting link.

The delay of two link level retransmissions was not enough to cause retransmission timeouts in general. There was only a few cases in which delayed acknowledgments caused an unnecessary retransmission of a segment. In those cases the delay affected the first packet of the TCP transfer from the server to client. Later packets were retransmitted unnecessarily only if acknowledgments were dropped. A delayed acknowledgment did not cause an RTO, because the subsequent acknowledgment arrived in time and cumulatively acknowledged all preceding packets. If two subsequent acknowledgments were delayed, an unnecessary retransmission of a packet occurred.

6.3.2 Baseline TCP with TCP Timestamps

With the baseline TCP with TCP Timestamps the link capable of up to two retransmissions typically improved the response times compared to once retransmitting link. Especially with medium and large main objects, the improvement was notable. The improvement in performance resulted from the reduced amount of packet losses. Especially the lost acknowledgments caused retransmission timeouts with the once retransmitting link. With this link configuration, the number of packet losses was typically about one third to two thirds compared to the once retransmitting links test results. For example in tests with workload `m+2m` the median of response time was almost same than with once retransmitting link using IW4 enhanced TCP. Because TCP with initial window of 4 packets has been more efficient in general with our workloads, the twice retransmitting link improved the performance remarkably. The throughput of different TCP transfers was closer to each other than in tests with low ARQ persistency. Table 19 summarizes the improvement in response time with different workloads.

Workload	Improvement
`s+2s`	+8.5%
`s+2m`	+4.3%
`s+8m`	-0.1%
`m+2m`	+19.8%
`m+8m`	+10.1%
`l+8m`	+15.0%

Table 19: Improvement in response times with different workload compared to the once retransmitting links' baseline TCP with TCP Timestamps.

In tests with **workload** `s+8m` the sum over maximum packet drops in connections was 23, which is about a half of the number in equivalent test with once retransmitting link. The differences between throughput of individual connections were closer because

of this. The median of response times was 20.16 seconds, which is almost equal to the tests with once retransmitting link. This test case was the only one whose response time did not improve compared to the results with the previous link. Like discussed before, the total of nine TCP transfers is a little forgiving for delays in the first connections, because the last in-line object is transferred without concurrency in the optimal case. If the main object would be larger, its TCP transfer would be more important and the reduced number of packet losses would have a bigger effect on the response time. Some retransmission timeouts existed, all because of lost or delayed acknowledgments. The recovery was handled using the TCP Timestamps information together with the Linux undo mechanism, which allowed the TCP to revert the congestion window to its original value. Because the acknowledgment subsequent to the packet whose RTO was triggered acknowledged all packets, the conventional RTO algorithm would also have avoided further unnecessary retransmissions. The recoveries were similar to figure 7.

Workload `m+8m` was transferred in a median time of 20.57 seconds. Total amount of error related drops was 20, which is about 40% of the number of drops with lossy link with low ARQ persistency. The queue at the last-hop router was at most 15 units, which is more than with once retransmitting link. The queue length was highest at a time when a bad state caused packet losses, and link layer retransmissions were performed to recover from them. At that time there was several TCP transfers taking place.

During the tests with **workload** `1+8m` we had both congestion and error related drops, majority of which were congestion related. Studying the results showed that the error related losses in main objects' transfers were divided quite equally to all test runs despite that the median the median of error related drops in the transfer main objects was zero. The high number of congestion drops resulted from slow-start overshoots which happened like in tests with optimal link, if bad states caused no packet drops. The sum of maximum drops in connection classes was 53, 28 of which were due to congestion.

6.3.3 Initial Window of 4 packets

The table 20 summarizes the amount of improvement in response time compared both to the baseline TCP with TCP Timestamps results and results with Initial Window of four segments with previous link configuration. Increasing Initial Window to four segments improved the response time compared to the results with baseline TCP using TCP Timestamps with all workloads. The amount of improvement varies only little between test cases with similar workloads. In tests with a small main object or only two in-line objects the improvement was 15%-18.6%. With larger workloads the improvement was smaller.

Workload	Improvement from BL	Improvement from once retransmitting link
s+2s	18.6%	-1.7%
s+2m	18.6%	19.6%
s+8m	15.0%	9.7%
m+2m	15.9%	15.8%
m+8m	8.3%	6.6%
l+8m	10.9%	22.5%

Table 20: Improvements in response times compared to the baseline TCP with TCP Timestamps and IW4 results in once retransmitting link.

Comparing the response times to the results of tests with Initial Window of four segments and lossy link with low ARQ persistency shows that there are a lot of differences in the amounts of improvement. This is a result of packet losses in tests with lossy link with low ARQ persistency, which is more sensitive to link level packet losses. Generally the results improved remarkably from the lossy link with low ARQ persistency results. With this link configuration, the number of packet losses was typically one fourth to two thirds compared to the once retransmitting links test results. Retransmission timeouts happened only, if acknowledgments were dropped in our tests. A packet which was delayed for 1400 ms due to two link layer retransmissions did not cause an RTO. The difference between the slowest and the fastest TCP transfers of in-line objects resulted from delays and dropped packets, while the fastest transfer did not suffer from any delays at all. Typically the queue at the last-hop router was at most 8 units in a test run. In worst case the length was 12 units in tests with workloads other than `l+8m`.

With **workload** `m+2m` the efficiency of TCP was very good. The response time improved 15.9% from the results with baseline TCP and 15.8% from the results with the once retransmitting link's tests. The increment in performance was a result from an improvement in error rate. The sum over maximum packet drops was only 5 packets, while it was 20 with the equivalent tests with previous tests.

In tests with **workload** `l+8m` the median of error related drops was 0. While the number of error related drops was decreased, more congestion related drops occurred at the last-hop router. That was partly because a packet that had to be retransmitted in the link layer forced all subsequent packets to be stored in the router buffer which filled the buffer more quickly. Another reason was that when packets were not dropped due to error, the behaviors were similar to the results in the optimal case tests which suffered from slow-start overshoot and other typical TCP behaviors in an environment consisting a

bottleneck link. Figure 12 shows a typical development of the queue at the last-hop router. The limit of the router queue is first reached and the transmission rate is slowed down. Quickly after this the transmissions of in-line objects are finished and more bandwidth becomes available to the transfer of the main object. The subsequent TCP transfers cause no other packet drops at the last-hop router.

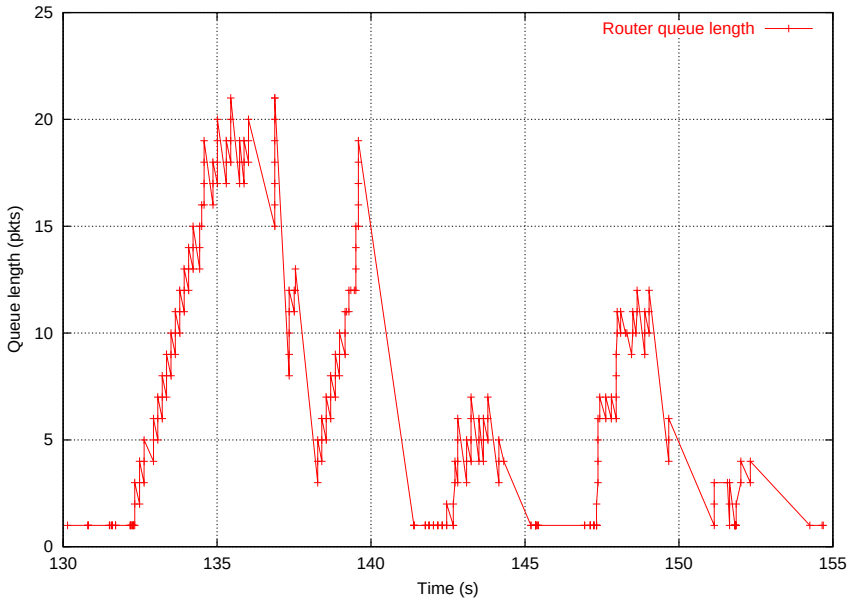

Figure 12: Development of the queue length at the last-hop router when transferring workload `1+8m` over a link capable of two retransmissions using IW4 enhanced TCP.

The sum of maximum packet drops in connection classes was quite high concerning that the median of congestion drops was only 2 and the median of error related drops was 0. The 75% percentile for main object was 4 for congestion related drops and 1 for error related ones and the maximum values 21 and 4. This means that only in very limited tests the maximum value was reached. In those tests the slow-start overshoot was similar than in the tests with optimal link. More detailed data on the test results can be viewer in the appendix B.3.2.

The median of response times was 10.9% better than with baseline TCP and 22.5% better than with the equivalent test with once retransmitting link. Stability of TCP transfers was decreased from the results with once retransmitting link, because typically the transfer of main object proceeded with only a few packet drops, and recovered efficiently using SACK information which limited the bandwidth available to other TCP transfers.

6.4 Lossy link with high ARQ persistency

In this subsection we present the results tested with link capable of three retransmissions.

6.4.1 Overview of the results

Because the delays caused by the maximum three link layer retransmissions were enough to cause spurious retransmission timeouts in TCP, we run tests with baseline TCP without TCP Timestamps, F-RTO and D-SACK, as well as with baseline TCP with Timestamps, all of which behave differently in case of a spurious retransmission timeout. In addition we run tests with Increased Initial Window of four segments (IW4) without the TCP Timestamps to have IW4 tests in which also unnecessary retransmissions of packets may occur.

Table 21 summarizes the test results with baseline TCP without the TCP Timestamps and the results of tests with Increased Initial Window of four segments. Table 22 summarizes the results of D-SACK or F-RTO enhanced TCP tests, and 23 the results of tests with baseline TCP with TCP Timestamps. The same metrics are reported as for the previous cases.

	BASELINE - TS						IW4 - TS					
WL	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	5.87	7.72	19.68	9.29	21.06	30.83	5.15	7.36	17.90	8.20	20.16	28.05
Med thro. (m)	1334	1182	1050	1649	1526	2932	1565	1381	1216	1927	1519	2771
Slowest thro. (i)	730	1476	1034	1262	982	540	1136	1686	1058	1396	912	641
Fastest thro. (i)	796	1618	1608	1317	1579	1382	1292	1782	1784	1524	1777	1418
Drops (c) median	0	0	0	0	0	17	0	0	0	0	0	2
Drops (e) median	0	0	0	0	0	0	0	0	0	0	0	0
Σ maximum drops	2	0	5	3	4	46	0	3	9	0	7	48

Table 21: Summary of third times retransmitting link test results of baseline TCP without TCP Timestamps and IW4 enhanced TCP.

In tests with lossy link with high ARQ persistency almost all error related packet losses were avoided, but the maximum delay of 2100 ms caused spurious retransmission timeouts in TCP. These delays decreased the stability between the TCP transfers compared to the results with lossy link with medium ARQ persistency. The router queue length varied more than in tests with low or medium ARQ persistency. During the link layer retransmissions the router queue length was increased in many test cases.

WL	D-SACK						F-RTO					
	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	6.09	8.41	19.82	8.60	21.62	29.70	5.87	8.11	20.56	9.68	21.31	31.09
Med thro. (m)	1211	1189	1122	1777	1570	2793	1212	1257	1121	1621	1436	2576
Slowest thro. (i)	695	1478	1013	1330	922	544	589	1500	938	1314	948	503
Fastest thro. (i)	848	1528	1581	1392	1517	1394	695	1569	1593	1371	1564	1445
Drops (c) median	0	0	0	0	0	16	0	0	0	0	0	15
Drops (e) median	0	0	0	0	0	0	0	0	0	0	0	0
Σ maximum drops	0	2	2	1	0	35	0	3	5	5	8	44

Table 22: Summary of third times retransmitting link test results of D-SACK and F-RTO enhanced TCP.

WL	BL + TS					
	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time s.	6.01	9.00	20.52	9.75	22.12	31.00
Med thro. (m) B/s	1171	1123	1112	1686	1519	2715
Slowest thro. (i) B/s	572	1319	965	1237	955	541
Fastest thro. (i) B/s	694	1392	1611	1325	1587	1376
Drops (c) median	0	0	0	0	0	16
Drops (e) median	0	0	0	0	0	0
Σ maximum drops	1	1	9	3	5	56

Table 23: Summary of the three times retransmitting link results of baseline TCP with TCP Timestamps.

6.4.2 Baseline TCP without TCP Timestamps

In tests with baseline TCP without TCP Timestamps the response times were close to and in some cases better than in tests baseline TCP with TCP Timestamps and a lossy link with medium ARQ persistency. There was more difference between individual test runs in these tests. This was a result from spurious retransmission timeouts in some tests, which were not efficiently recovered from without the TCP Timestamps option. Figure 13 illustrates a behavior in which unnecessarily retransmitted packet is followed by multiple unnecessary retransmissions. The figure depicts a behavior from a tests with **workload** s+2s.

In the figure a main object is being transferred. An RTO occurs to the fourth packet of the transfer because of a missing acknowledgment and it is retransmitted. The receiver acknowledges only the retransmitted packet. TCP sender retransmits all data to the

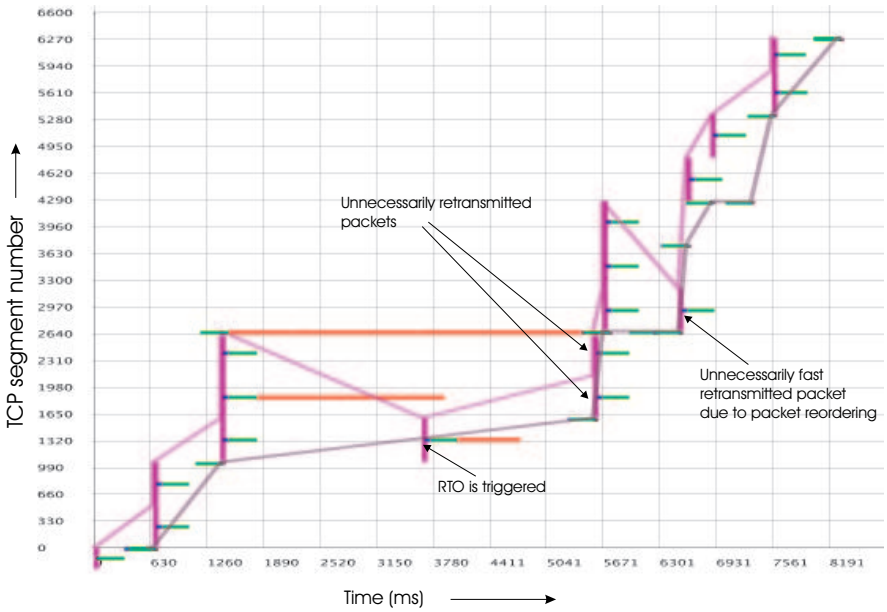

Figure 13: A spurious retransmission timeout followed by multiple unnecessary retransmissions of packets.

point where RTO was expired despite they were already delivered successfully, which causes multiple duplicate acknowledgments being sent to the TCP sender. Due to the duplicate acknowledgments, the seventh packet is retransmitted with fast recovery. The fast recovery should not take place in this situation [Bla03], but the Linux TCP seems not to be able to avoid it.

In the test case described above a total of four packets were unnecessarily retransmitted. In the test a total of 13 packets were transmitted, which means that 30.1% of the packets were unnecessarily retransmitted. This kind of behavior leads to very low performance, but because there were only a few unnecessary retransmission timeouts in these test runs, the median of response time was however improved from the tests with previous link configuration and TCP with TCP Timestamps. The length of the router queue was similar to the previous tests.

In tests with **workload** `s+2m` the link layer was able to retransmit all erroneous packets, and thus TCP level did not experience any packet drops. This had a good effect on performance. The response time was 8.5% better than with the baseline TCP with TCP Timestamps. Despite packet drops were not experienced, some spurious retransmission timeouts occurred. The recovery was similar to the one described in figure 13.

The response time of **workload** `s+8m` was improved from the results with lossy link with medium ARQ persistency and baseline TCP with TCP Timestamps, but the dif-

ference was not as big as with workload `s+2m`. The median of response time was 19.68 seconds, which is 2.4% improvement. The improvement in performance was again due to the notable decrement in error related packet drops. In tests with a link capable of two retransmissions the sum of maximum packet drops in connection classes was 23 packet drops, while it was 5 in these tests. There were many unnecessary retransmissions after spurious retransmission timeouts.

With **workload** `m+2m` the response time was decreased 7.9% to 9.29 seconds compared to the lossy link with medium ARQ persistency and baseline TCP with TCP Timestamps. We observed multiple cases with spurious retransmission timeouts after which several packets were resent unnecessarily. The retransmissions affected more to the response time than the reduced number of error related drops, which was already low in the tests with the link capable of two retransmissions.

With **workload** `m+8m` the number of drops was reduced even more than with workload `s+8m`, but the response time was only marginally improved. Inspecting the TCP traces showed, that a phenomenon similar to the figure 13 occurred often if an acknowledgment was delayed and caused a spurious retransmission timeout. This explains the small benefit gained from the decrement in the error related packet drops. This test case was one of the longest in our set, and multiple bad states occurred in these tests with increased probability. If the TCP Timestamps or F-RTO options were enabled, the unnecessary retransmissions could have been avoided which could have increased the response time remarkably.

In tests with **workload** `l+8m` the response time was decreased 3.7% from the results with a link capable of two retransmissions. The sum of maximum packet drops in connections decreased by 7 to 46 units, but the median of congestion related drops increased by 2 to 17 units. The lower quartile of congestion related drops was 15 and upper quartile 19 units (see appendix B.4.1), so the drops were quite equally divided. The congestion drops occurred due to slow-start overshoot, like in the previous tests. Because the TCP was only allowed to retransmit one packet for every incoming acknowledgment, the recovery phase took quite a long time, despite that with SACK unnecessary retransmission were avoided. This slowed down the TCP transfers of in-line objects, which both proceeded slowly due to small amount of available bandwidth.

The retransmission in the link layer had a major influence to the development of congestion in this test case. In some cases multiple late acknowledgments were delivered in a very short time to the TCP sender causing it to send burst of up to 24 packets to the TCP receiver. Despite every third packet was delayed 5 ms by the burst avoidance algorithm in Linux TCP, this kind of burst filled up the queue at once and caused multiple

packet drops at the last-hop router.

6.4.3 Initial Window of 4 packets

The TCP Timestamps option was disabled also in these tests, which allowed us to compare the results to the results with baseline TCP without Timestamps with this link configuration. The response times with all workloads were improved. Table 24 summarizes the improvements of response times. Compared to the tests with lossy link with medium ARQ persistency and Initial Window of four segments enhanced TCP with TCP Timestamps the response times were generally higher in these tests. The increment in response times resulted mostly from the excessive delays caused by the link layer retransmissions and from unnecessarily retransmitted packets. Especially with small workloads the delays were quite remarkable.

Workload	Improvement
s+2s	12.3%
s+2m	4.7%
s+8m	9.0%
m+2m	11.7%
m+8m	4.2%
l+8m	9.0%

Table 24: Improvements in response times compared to the baseline TCP without TCP Timestamps.

Spurious retransmission timeouts were not as common as with baseline TCP without TCP Timestamps, but several existed in the tests. The TCP traces were similar to the trace illustrated in figure 13, in which multiple packets were retransmitted unnecessarily after a spurious retransmission timeout. The main difference was that the TCP sender transmitted immediately four packets after the acknowledgment to the packet whose RTO expired. In tests with **workload** `m+2m` spurious retransmission timeouts caused more unnecessarily retransmitted packets than in the baseline tests without TCP Timestamps. During the transfer of the main object 9 packets were transmitted before RTO was triggered for the first of them. This caused 10 packets to be retransmitted unnecessarily, first of which was the packet whose RTO was triggered and last one the packet which was retransmitted with fast retransmit due to duplicate acknowledgments.The queue length at the last-hop router was generally similar to the results with previous link types.

With **workload** `m+8m` the length of the queue was increased up to 20 units in some test

cases. Not having any congestion related drops was luck in those cases, in which all four concurrent connections suffered a spurious retransmission timeout concurrently. After the packets whose RTO was expired were resent, three connections got acknowledgment almost simultaneously making them fill up the router queue with the unnecessary retransmissions.

In tests with **workload** `l+8m` a spurious retransmission timeout could cause the slow-start phase to end. However, because the router buffers fill up with this workload quite early when Initial Window of four segments (IW4) is used, the slow-start overshoot would end early in any case. In all previous IW4 tests, the slow-start overshoot has been avoided quite efficiently and thus a long good state has not an effect to decrease the response time like in tests with the baseline TCP. During the transmission of the main object spurious retransmission timeouts were not common after the connection had proceeded for some time. If a retransmission was necessary, the TCP more often recovered with fast retransmit.

6.4.4 D-SACK

In tests with this link configuration we have had many spurious retransmission timeouts, which were followed by multiple unnecessary retransmissions of packets. By disabling the TCP Timestamps we have assured that the D-SACK information is the only way to determine that a retransmission was unnecessary. Table 25 describes the differences in median response times compared to the baseline TCP without TCP Timestamps. If a value is marked with a plus sign, the response time has increased in tests with D-SACK, and if it has a minus sign, the response time has decreased.

Workload	Change from BL - TS
s+2s	+3.7%
s+2m	+8.9%
s+8m	+0.7%
m+2m	-7.42%
m+8m	+2.6%
l+8m	-3.6%

Table 25: Differences in median response times compared to the baseline TCP without TCP Timestamps.

In general D-SACK was not able to improve performance, because the test cases were so short that the TCP did not get any benefit from the congestion window's re-adjustment. The degradation in performance was because of an increased number of unnecessary re-

transmissions. Figure 14 depicts a recovery from RTO from test with workload `s+2s`. TCP sender retransmits the segment whose RTO was triggered. Despite that the acknowledgment after that acknowledges also new packets, all subsequent segments to the recovery point are retransmitted. The receiver informs the sender in each acknowledgment with a D-SACK block that the retransmission was not needed. The sender concludes that the retransmissions were unnecessary after receiving a D-SACK for every packet between the packet whose RTO was triggered and the recovery point, but the test ends before any benefit can be gained. Queue at the last hop router was typically at most four packets, which is equivalent to the results with baseline TCP.

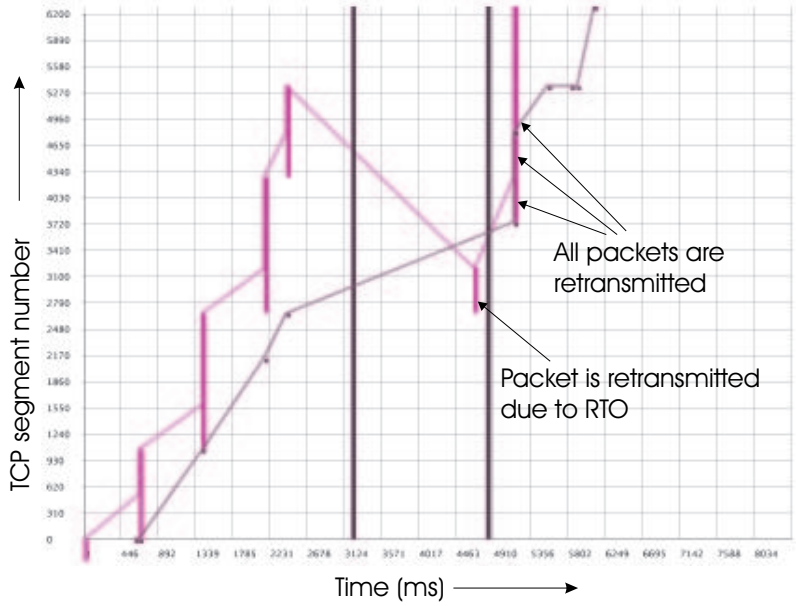

Figure 14: A spurious retransmission timeout and D-SACK recovery.

With **workload** `s+8m` the response times were very close to the tests with the baseline TCP without TCP Timestamps. With maximum of three link layer retransmissions quite many packets might arrive to the last-hop router during the retransmission. This resulted in greater variation in the length of the queue at the last-hop router than with the previous cases. Typically the queue was 4-6 units. This variation results from the extended delays while the link tries to retransmit dropped packets.

In tests with **workload** `m+2m` the sum over maximum packet drops was slightly less than in baseline tests without TCP Timestamps, but in this test case there was quite a lot spurious retransmission timeouts in the baseline tests, which reduced the performance. In these tests the performance was improved merely because there were less spurious retransmission timeouts than with baseline TCP without TCP Timestamps.

In tests with **workload** `m+8m` the lossy link with high ARQ persistency was able to completely avoid packet drops in the tests. This did not improve the median of response times however, but the median was 0.52 seconds more than with the baseline tests. The workload of this test case has still too short transfers to make use of the information of the necessity of the retransmissions.

Workload `l+8m` was the only test case in which we had a larger object, which is needed to benefit about the D-SACK information. In this test the median of response times was improved 3.7% from the baseline results. The sum over maximum drops in a connection was however reduced by 11 compared to the baseline tests, and also the median of congestion related drops in the main objects' transfer was reduced by one packet. Most of the losses were congestion related. Spurious retransmission timeouts occurred in the begin of a TCP transfer. After an RTO there were still most of the packets left to be transferred. This gave the sender time to use the information of the unnecessary retransmissions.

6.4.5 F-RTO

The table 26 the improvement from tests with baseline TCP without TCP Timestamps. Compared to the baseline TCP without TCP Timestamps the response time was increased in every test case but `s+2s`. The increment resulted from the same reason than in the D-SACK tests: different number of spurious retransmission timeouts. With `s+2s` the response times were identical with baseline without TCP Timestamps and with F-RTO. From tests with D-SACK the results have generally improved in cases which had spurious retransmission timeouts.

Workload	Change from BL - TS	Change from D-SACK
`s+2s`	0.0%	-3.6%
`s+2m`	+5.4%	-3.6%
`s+8m`	+4.5%	+3.7%
`m+2m`	+4.2%	+12.6%
`m+8m`	+1.2%	-1.4%
`l+8m`	+0.8%	+4.7%

Table 26: Differences in response times compared to the baseline TCP without TCP Timestamps compared to D-SACK enhanced TCP.

Reverting the congestion window after an RTO recovery was not nearly as important as sending new packets instantly and avoiding unnecessary retransmissions. This saving was

multiplied in subsequent connections, which had an opportunity to start earlier. In the tests with eight main objects, the TCP transfers proceeded in three sets. Performance was improved most if spurious retransmission timeouts occurred to the first TCP transfers. In tests with F-RTO the stability between TCP transfers was better than with other enhancements with this link configuration.

With **workload** `s+2s` we observed multiple spurious retransmission timeouts in our tests. The F-RTO algorithm was able to avoid all unnecessary retransmissions besides the packets whose RTO was triggered. Compared to the baseline case without TCP Timestamps, the median of response times was exactly the same. Although we observed multiple spurious retransmission timeouts in the baseline tests, almost 1/3 of the test runs happened to have no bad state at all, which clearly affects to the numerical results. Comparing the test runs in which spurious retransmission timeouts existed in both TCP variants showed, that F-RTO algorithm outperformed the baseline TCP. The F-RTO algorithm was usually able to complete the data transfer with the two new data packets, while the conventional TCP needed at least one more RTT to complete. Compared to the results in D-SACK tests the median of response times was 3.6% better in F-RTO tests.

With **workload** `s+2m` the median of response times was improved 3.6% from the D-SACK results. Like with the previous case, the median was higher than with the baseline results, which was due the differences in the network conditions between the tests. In this test we observed also a case in which the F-RTO algorithm was not able to declare a retransmission spurious, and two packets got sent unnecessarily after the packet whose RTO was expired. This happened during the transfer of the main object. A bad state caused an acknowledgment to be delayed for 2100 ms, which caused an RTO to the third from last packet. After the packet was retransmitted, the delayed acknowledgment was received, but because it only acknowledged the retransmitted packet, the F-RTO algorithm was reverted to the standard RTO algorithm and the last two packet were unnecessarily retransmitted. With the TCP Timestamps option enabled, these retransmissions would have been avoided with the Linux undo mechanism.

In the tests with **workload** `s+8m` we did not have as much RTOs as with the previous two test cases. Instead we observed quite a lot of 1400 ms to 2100 ms delays, which lengthened the response times. In these tests the transmission times of the first connections were very important, because of the limit in concurrent transmissions. Because of the limited number of RTOs, the response time was not very much subject to whether an advanced RTO algorithm was in use or not.

With **workload** `m+2m` the median of response times was 4.2% higher than in tests with baseline TCP without TCP Timestamps, and 12.6% higher than in tests with D-SACK.

Like discussed in analysis of D-SACK, the good results with D-SACK were not because of D-SACK was used, but merely for the lack of link delays to trigger spurious RTOs. In these tests the we observed many spurious retransmission timeouts. Many were recovered efficiently by F-RTO like with previous tests, but we also observed similar cases than the one discussed last in results with workload `s+8m` which F-RTO did not find spurious.

We also observed cases in which a packet subsequent to the one whose RTO was expired was dropped. This disabled also the F-RTO recovery which expects the following two acknowledgments to advance the window. Finally we observed two cases in which one of the last packets was dropped and the TCP had to recovered with RTO. These retransmission could not have been avoided by any means, but they had a very bad effect on the response time of that test run.

In tests with **workload** `l+8m` the unnecessary retransmission timeouts occurred mainly in the begin of a transfer of main objects. They were recovered with F-RTO without unnecessary retransmissions besides the packet whose RTO was triggered. However because the F-RTO algorithm continues with congestion avoidance if a retransmission is found spurious, the transfer of main object did not suffer from slow-start overshoot in those cases.

During congestion avoidance, the congestion window is incremented by one segment per round trip time while it is typically incremented by one per round trip time plus one per incoming acknowledgment. This resulted in loss of performance in the transfers of the main objects. For example in one test case the total transfer time of a main object was 28.7 seconds because congestion avoidance was in use almost for the whole connection. Another transfer of main object took only 19.2 seconds regardless of the slow-start overshoot.

Avoiding the slow-start overshoot had a great effect on the stability of the transfers. Transfers of in-line objects proceeded without problems and all in-line objects were transferred before the transfer of the main object ended, which was not the case if slow-start overshoot occurred. However, the transfer of the last in-line object was finished about five seconds earlier than the slow transfer of the main object. Figure 15 shows the fair transfers of the workload with F-RTO. It also gives a general overview of the transfers of this workload.

6.4.6 Baseline TCP with TCP Timestamps

Table 27 summarizes the differences of response times with baseline TCP with TCP Timestamps compared to baseline TCP without TCP Timestamps, D-SACK and F-RTO

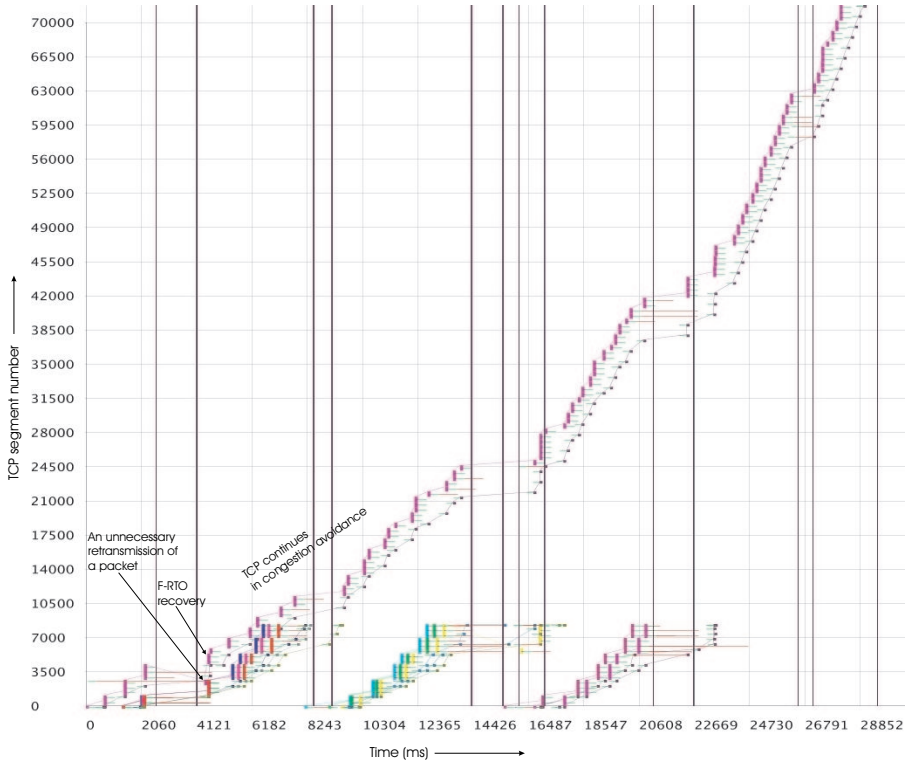

Figure 15: An F-RTO recovery from a spurious retransmission timeout with workload `l+8m`

TCP variants. Compared to the baseline the response times in all workloads were higher, which was a result from the network conditions. The results with D-SACK and F-RTO are closer to results of these tests. Compared to D-SACK, the response times were higher with all workloads but `s+2s`. Compared to F-RTO the response time was a bit better in some cases, but higher with others.

Workload	Change from BL - TS	Change from D-SACK	Change from F-RTO
`s+2s`	+2.4%	-1.3%	+2.4%
`s+2m`	+16.6%	+7.0%	+11.0%
`s+8m`	+4.3%	+3.5%	-0.2%
`m+2m`	+4.6%	+13.0%	+0.4%
`m+8m`	+5.0%	+2.3%	+3.8%
`l+8m`	+0.6%	+4.3%	-0.3%

Table 27: Differences in response times compared to the baseline TCP without TCP Timestamps compared to D-SACK and F-RTO enhanced TCP.

Majority of the results can be explained with different network conditions. If only cases

in which spurious retransmission timeouts occurred are discussed, response times with this TCP variant were better than with D-SACK and baseline TCP without TCP Timestamps. In situations which F-RTO was able to conclude an unnecessary retransmission spurious and retransmitted packet unnecessarily, the baseline TCP with TCP Timestamps avoided the unnecessary retransmissions. Because the TCP continues in slow-start after a spurious retransmission timeout in these tests, the behavior which was discussed in analysis of F-RTO with workload `1+2m` were avoided. This caused more congestion at the last-hop router, and instability between TCP transfers. With TCP Timestamps the TCP was able to avoid unnecessary retransmission also in cases which F-RTO was unable to detect them.

Because the TCP Timestamps option reduces the maximum payload size of a TCP segment by additional 12 bytes, the test cases in which TCP Timestamps can be transferred somewhat faster, but with workloads other than `1+8m` the benefit is marginal. In these tests the number and length of delays caused by the link level retransmissions are more important.

6.5 Summary of the results

This subsection summarizes briefly the results of the tests discussed in this section. For each link configuration we present a table which has a column for each TCP enhancement tested and a row for each workload.

Optimal link

Table 28 summarizes the response times of all TCP variants tested with optimal link. Because no error related packet losses nor delays occurred, increasing the initial window to four segments was the only enhancement which improved the performance. IW4 improved performance in tests with all workloads. Especially with small objects, the response times were improved remarkably, which is a result from decreased number of round trip times needed to transfer an object with TCP. The improved results with BL-TS, D-SACK and F-RTO tests originate from the additional overhead caused by the TCP Timestamps option in tests with BL+TS.

Workload	BL-TS	BL+TS	IW4+TS	D-SACK	F-RTO
s+2s	4.47 s	4.50 s	4.01 s	4.47 s	4.47 s
s+2m	6.31 s	6.39 s	5.77 s	6.30 s	6.31 s
s+8m	15.05 s	15.34 s	13.99 s	15.05 s	15.05 s
m+2m	6.93 s	7.05 s	6.60 s	6.93 s	6.93 s
m+8m	16.72 s	17.01 s	15.76 s	16.72 s	16.71 s
l+8m	22.22 s	23.59 s	21.80 s	22.21 s	22.21 s

Table 28: Response times of different test cases with optimal link.

Lossy link with low ARQ persistency

In tests with once retransmitting link we had multiple packet losses in a test. All packet losses were error related except in tests with workload `l+8m` which had also congestion related losses. Stability between TCP transfers was not very good. Due to the state changes, different test runs had very different network conditions. The additional delay caused by link layer retransmissions of packets did not cause spurious retransmission timeouts, but some packets were retransmitted unnecessarily due to lost acknowledgments. Typically, however, the next acknowledgment cumulatively acknowledged all outstanding packets and no other packets were retransmitted unnecessarily. Table 29 summarizes the results of tests with lossy link with low ARQ persistency. Increasing initial window to four segments improved the response times in all situations. Because there was only a few RTO related recoveries, the difference between different RTO based enhancements was small. Most of the differences resulted form the variation in network conditions.

Workload	BL-TS	BL+TS	IW4+TS	F-RTO
s+2s	6.70 s	6.45 s	4.72 s	6.59 s
s+2m	9.00 s	8.82 s	8.54 s	10.18 s
s+8m	21.85 s	20.13 s	18.97 s	20.47 s
m+2m	10.66 s	10.73 s	8.60 s	9.13 s
m+8m	20.90 s	22.88 s	20.19 s	21.56 s
l+8m	32.13 s	34.98 s	34.17 s	36.96 s

Table 29: Response times of different test cases with lossy link with low ARQ persistency.

Lossy link with medium ARQ persistency

In tests with lossy link with medium ARQ persistency the number of error related drops was decreased notably compared to the tests with once retransmitting link. The addi-

tional delay caused by two link level retransmissions did not cause spurious retransmission timeouts in general, and therefore only tests with baseline TCP with TCP Timestamps and IW4 enhanced TCP were run. Table 30 summarizes the results. Increasing Initial Window to four segments improved the performance in all tests. Stability between TCP transfers was improved notably compared to the results with once retransmitting link. Because the number of bad states varies in TCP transfers, the link level retransmission has an important role on stability.

Workload	BL+TS	IW4+TS
s+2s	5.90 s	4.80 s
s+2m	8.44 s	6.87 s
s+8m	20.16 s	17.13 s
m+2m	8.61 s	7.24 s
m+8m	20.57 s	18.86 s
l+8m	29.72 s	26.48 s

Table 30: Response times of different test cases with lossy link with medium ARQ persistency.

Lossy link with high ARQ persistency

Table 31 summarizes the results of lossy link with high ARQ persistency. Like discussed in the analysis, the results of baseline TCP without TCP Timestamps originated from considerably good network conditions. While in the other test the conditions were not as good, the numerical results do not show the benefits. In the analysis we found out that in tests which had spurious retransmission timeouts the F-RTO and BL+TS outperformed the baseline TCP without TCP Timestamps.

Workload	BL-TS	BL+TS	IW4-TS	D-SACK	F-RTO
s+2s	5.87 s	6.01 s	5.15 s	6.09 s	5.87 s
s+2m	7.72 s	9.00 s	7.36 s	8.41 s	8.11 s
s+8m	19.68 s	20.52 s	17.90 s	19.82 s	20.56 s
m+2m	9.29 s	9.75 s	8.20 s	8.60 s	9.68 s
m+8m	21.06 s	22.12 s	20.16 s	21.62 s	21.31 s
l+8m	30.83 s	31.00 s	28.05 s	29.70 s	31.09 s

Table 31: Response times of different test cases with lossy link with high ARQ persistency.

Generally the recovery was as efficient with F-RTO algorithm than with baseline TCP with TCP Timestamps, but some spurious retransmission timeouts were not detected with

F-RTO algorithm, which made the recovery more efficient with BL+TS in those cases. With F-RTO algorithm the stability between TCP transfers was however better. D-SACK was not able to improve the performance because it retransmitted packets unnecessarily and the TCP transfers did not benefit from the readjustment of the congestion window due to the small workloads.

	BL + TS					
WL	s+2s	s+2m	s+8m	m+2m	m+8m	l+8m
Response time (s)	6.34	8.40	20.79	9.20	21.91	30.09
Med thro. (m) B/s	1212	1187	1039	1820	1311	2798
Slowest thro. (i) B/s	803	1472	961	1350	859	526
Fastest thro. (i) B/s	848	1522	1636	1425	1626	1531
Drops (c) median	0	0	0	0	0	13
Drops (e) median	0	0	0	0	0	0
Σ maximum drops	2	2	13	1	9	39

Table 32: Summary of the three times retransmitting link results of baseline TCP with TCP Timestamps.

Because the tests with BL-TS happened to have notably better network conditions especially with the first workloads, we rerun the tests. Table 32 shows the results of those tests and table 33 the percentual differences counted with the new values from table 32. In many tests a spurious retransmission timeout caused multiple TCP packets to be retransmitted. This made the variation in response times higher with baseline TCP without TCP Timestamps than in similar tests with F-RTO or baseline TCP with TCP Timestamps. Increasing initial window to four segments improves response times notably in all tests.

Workload	BL-TS	BL+TS	IW4-TS	D-SACK	F-RTO
s+2s	6.34 s	-5.2%	-18.8%	-3.9%	-7.4%
s+2m	8.40 s	+7.1%	-12.4%	+0.1%	-3.4%
s+8m	20.79 s	+6.4%	-3.0%	-4.7%	-1.1%
m+2m	9.20 s	+6.0%	-10.9%	-6.5%	+5.2%
m+8m	21.91 s	+1.0%	-8.0%	-1.4%	-2.7%
l+8m	30.09 s	+3.0%	-6.8%	-1.3%	+3.3%

Table 33: Differences in response times with different test cases with test results from table 32.

6.6 Future work

In the future we intend to run tests using HTTP 1.1 type traffic with persistent connections and request pipelining. If the same workload is used, we can easily compare the results with those presented in this thesis. We hope to determine that HTTP 1.1 brings the HTTP traffic model closer to the bulk data transfers by avoiding slow-start phases between the transfers and transferring much of the data in the same TCP connection. In addition we intend to test with a wireless link which is notably faster than the one used in the tests in this thesis. Some tests could also be run with a fixed error model in which the same packets would be dropped for all TCP variants, but different with each test run. This would help us to make more accurate conclusions about the benefits of each TCP enhancement tested.

In addition to the modification in traffic model and link parameters, we are planning to make combinations of the TCP enhancements tested in this thesis. In particular we could combine Increased Initial Window of four segments to the F-RTO algorithm and the Linux Eifel type undo mechanism. The new version of F-RTO algorithm, which includes some improvements to more efficiently detect spurious retransmission timeouts by using SACK information if present, could be evaluated. We also intend to run tests with Control Block Interdependence (CBI), which was disabled in the Linux kernel in these tests.

7 Conclusion

Our objective was to evaluate the HTTP 1.0 traffic performance in wireless environment with a great variation on prevalent network conditions including short link outages which might increase the packet error rate dramatically. The target network consisted of a last-hop wireless link and a private LAN with considerably higher throughput and lower latency. The wireless link and the last-hop router were modeled with a real-time software emulator, which allowed the use of a real protocol stack and gave the control over link characteristics.

We compared the performance of a selected baseline TCP and a number TCP enhancements using four types of links including optimal link and links capable of retransmitting lost frames one, two and three times. The link layer retransmissions improved the packet error rate in the wireless link greatly but caused additional delays to the TCP transfers of packets. These delays might result in spurious retransmission timeouts in TCP, which are often followed by a number of unnecessary retransmissions of TCP packets with conventional TCP.

The tests were run on a Linux operating system, whose TCP implementation was modified to follow more closely the specifications suggested by the IETF. Our baseline TCP was a state-of-art TCP implementation, which included many of the TCP enhancements suggested to be used in wireless networks in RFC 3481 [Ina03]. The TCP enhancements compared to the baseline TCP were D-SACK and F-RTO which aimed to improve TCP performance in cases of sudden delays, lost retransmissions, burst losses and packet reordering compared to the conventional TCP. To evaluate the results, we also run tests without the Eifel-like undo-mechanism of Linux TCP by disabling the TCP Timestamps option. In addition we increased the TCP Initial Window to four segments and evaluated its result to the performance of TCP.

The workload selected in our test cases was chosen carefully according to the earlier research [Cho99][Bar98][Mah97] and existing statistical data which was obtained from a real Internet Service Provider's logs. The objects that were transferred with HTTP when requesting a WWW page were generally small. Because each object was transferred with a new TCP connection, the TCP transfers were inefficient because all TCP transfers are started with a new slow-start phase.

A detailed analysis was presented to explain the drawbacks and benefits of each enhancement and link configuration with different workloads. The test results indicated that especially the use of Increased Initial Window improved the performance of TCP with our workload. In most cases the baseline TCP without TCP Timestamps recovered

efficiently from lost TCP packets and congestion with SACK information. In tests cases that had spurious retransmission timeouts the F-RTO algorithm and the Linux Eifel -type undo mechanism improved the TCP performance and especially the stability between test cases and TCP transfers. D-SACK did not improve the performance of TCP in most of our tests. With our workloads the performance is not increased for undoing the congestion window adjustments after a spurious RTO, because the transferred objects are quite small. Instead, the unnecessary retransmissions of packets should be avoided, which does not happen with D-SACK.

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A Seawind parameters

In this section we list the Seawind parameters used in our tests. These parameters are listed to give the opportunity to rerun the tests. Depending on the state, we had different parameters in Seawind. In good state with once retransmitting link the Seawind Subsystem parameters were like described in table 34. When twice or third times retransmitting link was used, the values were identical to the values in table 34 except for the [delay_drop_threshold] parameter. With twice retransmitting link the value is 1401 and for three times retransmitting link 2101.

[rate_base]	[error_rate_type]	[link_overhead]
uplink=64000 bits/s	uplink=UNIT	uplink=DISABLED
downlink=64000 bits/s	downlink=UNIT	downlink=DISABLED
[user_max_rate]	[error_probability]	[reassembly]
uplink=1	uplink=static,0	uplink=FALSE
downlink=1	downlink=static,0	downlink=FALSE
[available_rate]	[error_handling]	[link_send_buffer_size]
uplink=DISABLED	uplink=DROP	uplink=9600 bytes
downlink=DISABLED	downlink=DROP	downlink=9600 bytes
[rate_change_interval]	[error_delay_function]	[link_receive_buffer_size]
uplink=DISABLED	uplink=DISABLED	uplink=9600 bytes
downlink=DISABLED	downlink=DISABLED	downlink=9600 bytes
[fragmentation]	[delay_drop_threshold]	[background_load]
uplink=DISABLED	uplink=701 ms	uplink=DISABLED
downlink=DISABLED	downlink=701 ms	downlink=DISABLED
[fragment_size]	[reordering]	[bgl_channel_allocation_algorithm]
uplink=DISABLED	uplink=FALSE	uplink=DISABLED
downlink=DISABLED	downlink=FALSE	downlink=DISABLED
[max_packet_size]	[output_dropper]	[bgl_user_priority]
uplink=2048 bytes	uplink=DISABLED	uplink=DISABLED
downlink=2048 bytes	downlink=DISABLED	downlink=DISABLED
[propagation_delay]	[queue_overflow_handling]	[bgl_average_rate]
uplink=300 ms	uplink=DROP	uplink=DISABLED
downlink=300 ms	downlink=DROP	downlink=DISABLED
[link_layer_ack_emulation]	[queue_max_length]	[bgl_max_users_per_channel]
uplink=TRUE	uplink=1	uplink=DISABLED
downlink=TRUE	downlink=20	downlink=DISABLED
[allocation_delay]	[queue_max_size]	[bgl_output_handling]
uplink=DISABLED	uplink=DISABLED	uplink=DISABLED
downlink=DISABLED	downlink=DISABLED	downlink=DISABLED
[link_idle_timeout]	[queue_max_delay]	[bgl_load_type]
uplink=DISABLED	uplink=DISABLED	uplink=DISABLED
downlink=DISABLED	downlink=DISABLED	downlink=DISABLED
[random_delay_length]	[queue_drop_policy]	
uplink=DISABLED	uplink=Tail	
downlink=DISABLED	downlink=Tail	
[random_delay_probability]	[protocol_overhead_per_packet]	
uplink=DISABLED	uplink=DISABLED	
downlink=DISABLED	downlink=DISABLED	

Table 34: Seawind parameters used in good state with once retransmitting link.

In bad state the parameters differ from the good state values by the following parameters:

[error_probability]	[error_handling]	[error_delay_function]
uplink=static,0.63	uplink=DELAY_ITERATE	uplink=static,700 ms
downlink=static,0.63	downlink=DELAY_ITERATE	downlink=static,700 ms

Table 35: Seawind parameters used in bad state.

In optimal tests the values differ from table 34 by the following parameters:

[error_probability]	[error_handling]	[error_delay_function]
uplink=DISABLED	uplink=DISABLED	uplink=DISABLED
downlink=DISABLED	downlink=DISABLED	downlink=DISABLED
[delay_drop_threshold]		
uplink=DISABLED		
downlink=DISABLED		

Table 36: Seawind optimal parameters.

With global parameters we adjusted functions which were common to all states in the tests, for example the length of the good and bad states. Table 37 describes the parameters used. The master state was used to allow the tests to begin with a bad state. It lasted for 1 ms after which states 1 and 2 were chosen with equal probability. The master state was never used after the begin of a test run. With optimal test we did not have any states. The first six parameters above the middle line were used with all tests.

All tests:	[traffic_type]: TUN_IP [snaplen]: 100 bytes [packet_logging_level]: ALL [filter_level]: BINARY [rewind_user_distribution]: DISABLED [logging_level]: NORMAL
All tests besides with optimal link	– Master – [state_probability]: 0,0.5,0.5 [state_duration]: static,1 ms – 1 – [state_probability]: 0,0,1 [state_duration]: exponential,6,0,9 s – 2 – [state_probability]: 0,1,0 [state_duration]: uniform,200,1900 ms

Table 37: Seawind global parameters.

B Test results

In this appendix we present the full detailed results of test cases. Results of different link characteristics are divided to subsections, and TCP variants in to sub subsections under the corresponding link.

B.1 Optimal case

In this subsection we present the results of optimal case tests.

B.1.1 Baseline TCP + TS

This sub subsection has the results of baseline TCP tests with TCP Timestamps option enabled.

```
OPTIMAL LINK - BL+TS
Workload: s+2s
====================
Total time of a basic test: min: 3.84, max: 3.85, median: 3.85 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.84     | 3.85     | 3.85     | 3.85     | 3.85     |
  throughput          | 1633.00  | 1635.00  | 1635.00  | 1635.00  | 1638.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.32     | 2.32     | 2.32     | 2.33     | 2.33     |
  throughput          | 899.00   | 900.00   | 902.00   | 903.00   | 903.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.33     | 2.33     | 2.33     | 2.33     | 2.34     |
  throughput          | 896.00   | 900.00   | 900.00   | 900.00   | 900.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL+TS
Workload: s+2m
====================
Total time of a basic test: min: 5.77, max: 5.78, median: 5.77 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.98     | 3.98     | 3.98     | 3.98     | 4.00     |
  throughput          | 1570.00  | 1578.00  | 1578.00  | 1578.00  | 1579.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.31     | 4.33     | 4.33     | 4.33     | 4.34     |
  throughput          | 1933.00  | 1934.00  | 1935.00  | 1936.00  | 1944.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.42     | 4.42     | 4.42     | 4.42     | 4.42     |
  throughput          | 1896.00  | 1896.00  | 1897.00  | 1897.00  | 1897.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL+TS
Workload: s+8m
====================
Total time of a basic test: min: 14.65, max: 14.73, median: 14.72 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.25     | 4.25     | 4.25     | 4.25     | 4.27     |
```

```
  throughput          | 1471.00  | 1478.00  | 1478.00  | 1478.00  | 1481.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.64     | 4.65     | 4.65     | 4.65     | 4.75     |
  throughput          | 1764.00  | 1803.00  | 1803.00  | 1804.00  | 1808.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.85     | 4.85     | 4.86     | 4.86     | 4.86     |
  throughput          | 1726.00  | 1726.00  | 1726.00  | 1728.00  | 1730.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.86     | 4.86     | 4.86     | 4.87     | 5.11     |
  throughput          | 1642.00  | 1722.00  | 1725.00  | 1726.00  | 1727.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.07     | 5.15     | 5.16     | 5.17     | 5.18     |
  throughput          | 1619.00  | 1621.00  | 1625.00  | 1627.00  | 1654.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.24     | 5.28     | 5.28     | 5.28     | 5.28     |
  throughput          | 1587.00  | 1589.00  | 1589.00  | 1589.00  | 1599.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.26     | 5.36     | 5.38     | 5.38     | 5.38     |
  throughput          | 1557.00  | 1558.00  | 1558.00  | 1564.00  | 1593.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.39     | 5.56     | 5.57     | 5.57     | 5.59     |
  throughput          | 1500.00  | 1505.00  | 1506.00  | 1509.00  | 1555.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.44     | 5.68     | 5.68     | 5.69     | 5.69     |
  throughput          | 1472.00  | 1473.00  | 1474.00  | 1476.00  | 1541.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL+TS
Workload: m+2m
====================
Total time of a basic test: min: 6.43, max: 6.44, median: 6.44 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.55     | 5.56     | 5.56     | 5.56     | 5.57     |
  throughput          | 2260.00  | 2262.00  | 2262.00  | 2262.00  | 2264.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.96     | 4.97     | 4.98     | 4.98     | 4.98     |
  throughput          | 1684.00  | 1685.00  | 1685.00  | 1686.00  | 1689.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.08     | 5.08     | 5.08     | 5.08     | 5.09     |
  throughput          | 1648.00  | 1649.00  | 1649.00  | 1649.00  | 1651.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL+TS
Workload: m+8m
====================
Total time of a basic test: min: 16.38, max: 16.44, median: 16.40 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.19     | 6.19     | 6.19     | 6.19     | 6.20     |
  throughput          | 2030.00  | 2031.00  | 2031.00  | 2031.00  | 2033.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.44     | 4.45     | 4.45     | 4.48     | 4.50     |
  throughput          | 1863.00  | 1873.00  | 1884.00  | 1886.00  | 1890.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.27	5.28	5.28	5.28	5.29
throughput	1585.00	1587.00	1587.00	1587.00	1590.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.49	5.49	5.49	5.49	5.49
throughput	1528.00	1528.00	1528.00	1528.00	1529.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.49	5.50	5.50	5.50	5.51
throughput	1523.00	1523.00	1523.00	1525.00	1527.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.50	5.50	5.50	5.51	5.52
throughput	1520.00	1522.00	1523.00	1523.00	1525.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.70     | 5.71     | 5.71     | 5.71     | 5.71     |
  throughput          | 1469.00  | 1469.00  | 1469.00  | 1469.00  | 1472.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.71     | 5.73     | 5.73     | 5.73     | 5.75     |
  throughput          | 1459.00  | 1464.00  | 1464.00  | 1464.00  | 1467.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.15     | 6.16     | 6.16     | 6.16     | 6.16     |
  throughput          | 1361.00  | 1361.00  | 1361.00  | 1361.00  | 1363.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL+TS
Workload: l+8m
```

```
====================
Total time of a basic test: min: 22.97, max: 23.00, median: 22.98 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 18.26    | 18.26    | 18.26    | 18.26    | 18.27    |
  throughput          | 3930.00  | 3931.00  | 3931.00  | 3931.00  | 3931.00  |
  rexmt data pkts     | 16.00    | 16.00    | 16.00    | 16.00    | 16.00    |
  duplicate acks      | 40.00    | 40.00    | 40.00    | 40.00    | 40.00    |
  triple dupacks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  pkts dropped (q)    | 16.00    | 16.00    | 16.00    | 16.00    | 16.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 53.00    | 53.00    | 53.00    | 53.00    | 53.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.39     | 4.39     | 4.39     | 4.41     | 4.42     |
  throughput          | 1896.00  | 1901.00  | 1908.00  | 1908.00  | 1912.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.58     | 4.59     | 4.60     | 4.60     | 4.61     |
  throughput          | 1818.00  | 1822.00  | 1823.00  | 1825.00  | 1830.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.13     | 6.13     | 6.14     | 6.14     | 6.14     |
  throughput          | 1365.00  | 1365.00  | 1365.00  | 1368.00  | 1368.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.55     | 6.55     | 6.57     | 6.57     | 6.57     |
  throughput          | 1277.00  | 1277.00  | 1277.00  | 1279.00  | 1279.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 9.24     | 9.47     | 9.47     | 9.47     | 9.47     |
  throughput          | 885.00   | 885.00   | 885.00   | 885.00   | 907.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 3.00     | 3.00     | 3.00     | 3.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 11.21    | 11.22    | 11.22    | 11.23    | 11.24    |
  throughput          | 746.00   | 747.00   | 747.00   | 747.00   | 748.00   |
  rexmt data pkts     | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  duplicate acks      | 7.00     | 7.00     | 7.00     | 7.00     | 7.00     |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 5.00     | 5.00     | 5.00     | 5.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	11.34	11.34	11.34	11.34	11.39
throughput	736.00	739.00	740.00	740.00	740.00
rexmt data pkts	1.00	1.00	1.00	1.00	1.00
duplicate acks	7.00	7.00	7.00	7.00	7.00
triple dupacks	1.00	1.00	1.00	1.00	1.00
pkts dropped (q)	1.00	1.00	1.00	1.00	1.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	5.00	5.00	5.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	11.47	11.47	11.49	11.49	11.51
throughput	728.00	730.00	730.00	731.00	731.00
rexmt data pkts	1.00	1.00	1.00	1.00	1.00
duplicate acks	7.00	7.00	7.00	7.00	7.00
triple dupacks	1.00	1.00	1.00	1.00	1.00
pkts dropped (q)	1.00	1.00	1.00	1.00	1.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	5.00	5.00	5.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

B.1.2 IW4 + TS

This sub subsection has the results of Initial Window of four segments with TCP Timestamps option enabled.

```
OPTIMAL LINK - IW4
Workload: s+2s
====================
Total time of a basic test: min: 3.39, max: 3.40, median: 3.40 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.39     | 3.40     | 3.40     | 3.40     | 3.40     |
  throughput          | 1848.00  | 1849.00  | 1849.00  | 1849.00  | 1853.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 1.62     | 1.63     | 1.63     | 1.63     | 1.63     |
  throughput          | 1283.00  | 1284.00  | 1286.00  | 1288.00  | 1293.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 1.89     | 1.90     | 1.90     | 1.90     | 1.90     |
  throughput          | 1105.00  | 1105.00  | 1105.00  | 1105.00  | 1109.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - IW4
Workload: s+2m
====================
Total time of a basic test: min: 5.15, max: 5.17, median: 5.16 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.38     | 3.38     | 3.38     | 3.38     | 3.39     |
  throughput          | 1856.00  | 1859.00  | 1859.00  | 1859.00  | 1863.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.36     | 3.36     | 3.36     | 3.36     | 3.36     |
  throughput          | 2493.00  | 2493.00  | 2494.00  | 2494.00  | 2499.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.80     | 3.81     | 3.81     | 3.81     | 3.82     |
  throughput          | 2196.00  | 2201.00  | 2202.00  | 2203.00  | 2207.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - IW4
Workload: s+8m
====================
Total time of a basic test: min: 13.38, max: 13.38, median: 13.38 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.67     | 3.68     | 3.68     | 3.68     | 3.68     |
```

```
  throughput          | 1707.00  | 1709.00  | 1709.00  | 1710.00  | 1713.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.08     | 4.08     | 4.08     | 4.08     | 4.09     |
  throughput          | 2052.00  | 2053.00  | 2053.00  | 2053.00  | 2056.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.51     | 4.52     | 4.52     | 4.52     | 4.52     |
  throughput          | 1857.00  | 1857.00  | 1857.00  | 1857.00  | 1860.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.56     | 4.58     | 4.58     | 4.59     | 4.59     |
  throughput          | 1828.00  | 1829.00  | 1831.00  | 1831.00  | 1837.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.94     | 4.95     | 4.95     | 4.95     | 4.95     |
  throughput          | 1694.00  | 1694.00  | 1694.00  | 1694.00  | 1696.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.09     | 5.10     | 5.10     | 5.10     | 5.10     |
  throughput          | 1642.00  | 1642.00  | 1643.00  | 1643.00  | 1648.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.09     | 5.11     | 5.11     | 5.11     | 5.11     |
  throughput          | 1641.00  | 1642.00  | 1642.00  | 1642.00  | 1647.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.11     | 5.11     | 5.11     | 5.11     | 5.11     |
  throughput          | 1640.00  | 1641.00  | 1642.00  | 1642.00  | 1642.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
```

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  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.11     | 5.11     | 5.11     | 5.11     | 5.11     |
  throughput          | 1640.00  | 1641.00  | 1642.00  | 1642.00  | 1642.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - IW4
Workload: m+2m
====================
Total time of a basic test: min: 5.98, max: 5.99, median: 5.99 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.09     | 5.10     | 5.10     | 5.10     | 5.10     |
  throughput          | 2467.00  | 2467.00  | 2467.00  | 2467.00  | 2471.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.19     | 4.20     | 4.20     | 4.20     | 4.20     |
  throughput          | 1996.00  | 1996.00  | 1996.00  | 1996.00  | 1999.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.63     | 4.64     | 4.64     | 4.64     | 4.64     |
  throughput          | 1807.00  | 1808.00  | 1808.00  | 1808.00  | 1811.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - IW4
Workload: m+8m
====================
Total time of a basic test: min: 15.14, max: 15.16, median: 15.15 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.82     | 5.83     | 5.83     | 5.83     | 5.83     |
  throughput          | 2157.00  | 2157.00  | 2157.00  | 2158.00  | 2160.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 3.96     | 3.96     | 3.97     | 3.97     |
  throughput          | 2112.00  | 2113.00  | 2117.00  | 2117.00  | 2127.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.93	4.93	4.93	4.93	4.93
throughput	1700.00	1700.00	1700.00	1700.00	1702.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	1.00	1.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.32	5.34	5.34	5.34	5.34
throughput	1571.00	1571.00	1571.00	1571.00	1577.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	1.00	1.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.34	5.34	5.34	5.34	5.34
throughput	1570.00	1570.00	1570.00	1570.00	1571.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	1.00	1.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.34	5.35	5.35	5.35	5.35
throughput	1568.00	1568.00	1568.00	1568.00	1570.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	1.00	1.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.35     | 5.35     | 5.35     | 5.35     | 5.35     |
  throughput          | 1568.00  | 1568.00  | 1568.00  | 1568.00  | 1568.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.36     | 5.37     | 5.37     | 5.37     | 5.37     |
  throughput          | 1562.00  | 1562.00  | 1562.00  | 1562.00  | 1564.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.81     | 5.82     | 5.82     | 5.82     | 5.82     |
  throughput          | 1440.00  | 1440.00  | 1440.00  | 1440.00  | 1442.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - IW4
Workload: l+8m
```

```
====================
Total time of a basic test: min: 21.18, max: 21.19, median: 21.18 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 19.39    | 19.39    | 19.47    | 19.47    | 19.48    |
  throughput          | 3686.00  | 3687.00  | 3688.00  | 3702.00  | 3703.00  |
  rexmt data pkts     | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  duplicate acks      | 28.00    | 28.00    | 28.00    | 28.00    | 28.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 28.00    | 28.00    | 28.00    | 28.00    | 28.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.00     | 6.01     | 6.01     | 6.01     | 6.01     |
  throughput          | 1396.00  | 1396.00  | 1396.00  | 1396.00  | 1398.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.25     | 6.25     | 6.25     | 6.25     | 6.29     |
  throughput          | 1333.00  | 1341.00  | 1341.00  | 1341.00  | 1342.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.28     | 6.28     | 6.29     | 6.29     | 6.32     |
  throughput          | 1327.00  | 1333.00  | 1333.00  | 1334.00  | 1336.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.28     | 6.29     | 6.29     | 6.31     | 6.39     |
  throughput          | 1311.00  | 1329.00  | 1329.00  | 1333.00  | 1335.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.05     | 7.06     | 7.06     | 7.06     | 7.06     |
  throughput          | 1187.00  | 1187.00  | 1187.00  | 1187.00  | 1190.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.06     | 7.07     | 7.07     | 7.07     | 7.07     |
  throughput          | 1185.00  | 1186.00  | 1186.00  | 1186.00  | 1187.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 9.20     | 9.21     | 9.21     | 9.21     | 9.22     |
  throughput          | 910.00   | 910.00   | 910.00   | 910.00   | 911.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 3.00     | 3.00     | 3.00     | 3.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 13.42    | 13.56    | 13.57    | 13.57    | 13.57    |
  throughput          | 618.00   | 618.00   | 618.00   | 618.00   | 625.00   |
  rexmt data pkts     | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

B.1.3 Baseline TCP - TS

This sub subsection has the results of baseline TCP tests with TCP Timestamps option disabled.

```
OPTIMAL LINK - BL-TS
Workload: s+2s
====================
Total time of a basic test: min: 3.79, max: 3.82, median: 3.79 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.79     | 3.79     | 3.79     | 3.79     | 3.82     |
  throughput          | 1644.00  | 1659.00  | 1659.00  | 1659.00  | 1659.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.32     | 2.32     | 2.32     | 2.32     | 2.32     |
  throughput          | 905.00   | 905.00   | 905.00   | 905.00   | 905.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.32     | 2.32     | 2.32     | 2.32     | 2.32     |
  throughput          | 904.00   | 904.00   | 905.00   | 905.00   | 905.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL-TS
Workload: s+2m
====================
Total time of a basic test: min: 5.69, max: 5.70, median: 5.69 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 3.94     | 3.94     | 3.94     | 3.94     |
  throughput          | 1595.00  | 1597.00  | 1597.00  | 1597.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.16     | 4.16     | 4.16     | 4.16     | 4.16     |
  throughput          | 2013.00  | 2016.00  | 2016.00  | 2016.00  | 2016.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.35     | 4.35     | 4.35     | 4.35     |
  throughput          | 1927.00  | 1929.00  | 1929.00  | 1929.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL-TS
Workload: s+8m
====================
Total time of a basic test: min: 14.43, max: 14.44, median: 14.44 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.20     | 4.20     | 4.20     | 4.24     |
```

```
  throughput          | 1484.00  | 1496.00  | 1496.00  | 1496.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.57     | 4.57     | 4.57     | 4.57     | 4.57     |
  throughput          | 1833.00  | 1833.00  | 1833.00  | 1833.00  | 1833.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.76     | 4.76     | 4.76     | 4.76     | 4.76     |
  throughput          | 1761.00  | 1761.00  | 1761.00  | 1762.00  | 1762.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.76     | 4.76     | 4.76     | 4.76     | 4.76     |
  throughput          | 1760.00  | 1761.00  | 1761.00  | 1761.00  | 1761.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.03     | 5.09     | 5.09     | 5.09     | 5.09     |
  throughput          | 1646.00  | 1646.00  | 1646.00  | 1647.00  | 1666.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.18     | 5.18     | 5.18     | 5.18     | 5.18     |
  throughput          | 1618.00  | 1618.00  | 1618.00  | 1618.00  | 1618.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.21     | 5.21     | 5.21     | 5.21     | 5.22     |
  throughput          | 1605.00  | 1608.00  | 1608.00  | 1608.00  | 1609.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.42     | 5.43     | 5.43     | 5.44     | 5.46     |
  throughput          | 1535.00  | 1542.00  | 1543.00  | 1543.00  | 1546.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.46     | 5.46     | 5.46     | 5.61     | 5.61     |
  throughput          | 1495.00  | 1495.00  | 1535.00  | 1535.00  | 1536.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL-TS
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 6.32, median: 6.32 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 5.51     | 5.51     | 5.51     | 5.51     |
  throughput          | 2282.00  | 2282.00  | 2282.00  | 2283.00  | 2283.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 4.78     | 4.78     | 4.78     | 4.78     |
  throughput          | 1753.00  | 1753.00  | 1753.00  | 1753.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 4.97     | 4.97     | 4.98     | 4.98     |
  throughput          | 1685.00  | 1685.00  | 1685.00  | 1685.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL-TS
Workload: m+8m
====================
Total time of a basic test: min: 16.09, max: 16.14, median: 16.10 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.14     | 6.15     | 6.15     | 6.15     | 6.16     |
  throughput          | 2043.00  | 2045.00  | 2046.00  | 2046.00  | 2050.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.35     | 4.36     | 4.40     | 4.40     |
  throughput          | 1905.00  | 1908.00  | 1922.00  | 1927.00  | 1927.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.20	5.20	5.20	5.20	5.21
throughput	1610.00	1613.00	1613.00	1613.00	1613.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.38	5.38	5.38	5.38	5.38
throughput	1558.00	1558.00	1558.00	1558.00	1560.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.38	5.38	5.38	5.38	5.39
throughput	1557.00	1557.00	1558.00	1558.00	1558.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	1.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.40	5.40	5.40	5.40	5.40
throughput	1552.00	1552.00	1552.00	1552.00	1552.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 5.58     | 5.59     | 5.59     | 5.60     |
  throughput          | 1497.00  | 1500.00  | 1501.00  | 1501.00  | 1507.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.60     | 5.60     | 5.60     | 5.60     | 5.61     |
  throughput          | 1496.00  | 1497.00  | 1497.00  | 1497.00  | 1497.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.03     | 6.03     | 6.03     | 6.03     | 6.03     |
  throughput          | 1391.00  | 1392.00  | 1392.00  | 1392.00  | 1392.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - BL-TS
Workload: l+8m
```

```
====================
Total time of a basic test: min: 21.59, max: 21.64, median: 21.61 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 18.82    | 18.82    | 18.84    | 18.87    | 18.87    |
  throughput          | 3805.00  | 3805.00  | 3809.00  | 3814.00  | 3814.00  |
  rexmt data pkts     | 18.00    | 18.00    | 18.00    | 18.00    | 18.00    |
  duplicate acks      | 35.00    | 35.00    | 35.00    | 35.00    | 35.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 18.00    | 18.00    | 18.00    | 18.00    | 18.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 50.00    | 50.00    | 50.00    | 50.00    | 50.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.47     | 4.48     | 4.48     | 4.49     | 4.50     |
  throughput          | 1862.00  | 1867.00  | 1869.00  | 1871.00  | 1875.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.68     | 4.68     | 4.68     | 4.70     | 4.72     |
  throughput          | 1778.00  | 1783.00  | 1788.00  | 1790.00  | 1792.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.65     | 5.66     | 5.66     | 5.66     | 5.66     |
  throughput          | 1481.00  | 1481.00  | 1481.00  | 1481.00  | 1483.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.06     | 6.07     | 6.07     | 6.07     | 6.07     |
  throughput          | 1382.00  | 1382.00  | 1382.00  | 1382.00  | 1383.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.46     | 6.47     | 6.47     | 6.47     | 6.47     |
  throughput          | 1295.00  | 1296.00  | 1296.00  | 1296.00  | 1297.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 9.56     | 9.56     | 9.56     | 9.56     | 9.56     |
  throughput          | 877.00   | 877.00   | 877.00   | 877.00   | 877.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	9.57	9.57	9.57	9.57	9.57
throughput	876.00	876.00	876.00	876.00	876.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	13.76	13.76	13.78	13.78	13.81
throughput	607.00	608.00	608.00	609.00	609.00
rexmt data pkts	2.00	2.00	2.00	2.00	2.00
duplicate acks	6.00	6.00	6.00	6.00	6.00
triple dupacks	1.00	1.00	1.00	1.00	1.00
pkts dropped (q)	2.00	2.00	2.00	2.00	2.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	5.00	5.00	5.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

B.1.4 D-SACK

This sub subsection has the results of D-SACK tests.

```
OPTIMAL LINK - D-SACK
Workload: s+2s
====================
Total time of a basic test: min: 3.79, max: 3.82, median: 3.79 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.79     | 3.79     | 3.79     | 3.79     | 3.82     |
  throughput          | 1644.00  | 1659.00  | 1659.00  | 1659.00  | 1659.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.32     | 2.32     | 2.32     | 2.32     | 2.32     |
  throughput          | 905.00   | 905.00   | 905.00   | 905.00   | 905.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.32     | 2.32     | 2.32     | 2.32     | 2.32     |
  throughput          | 904.00   | 904.00   | 904.00   | 904.00   | 905.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - D-SACK
Workload: s+2m
====================
Total time of a basic test: min: 5.69, max: 5.69, median: 5.69 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 3.94     | 3.94     | 3.94     | 3.94     |
  throughput          | 1597.00  | 1597.00  | 1597.00  | 1597.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.16     | 4.16     | 4.16     | 4.30     | 4.31     |
  throughput          | 1947.00  | 1948.00  | 2016.00  | 2016.00  | 2016.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.35     | 4.35     | 4.35     | 4.35     |
  throughput          | 1929.00  | 1929.00  | 1929.00  | 1929.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - D-SACK
Workload: s+8m
====================
Total time of a basic test: min: 14.19, max: 14.44, median: 14.44 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.20     | 4.20     | 4.20     | 4.24     |
```

```
  throughput          | 1484.00  | 1496.00  | 1496.00  | 1496.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.57     | 4.57     | 4.57     | 4.57     | 4.57     |
  throughput          | 1833.00  | 1833.00  | 1833.00  | 1833.00  | 1833.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.76     | 4.76     | 4.76     | 4.76     | 4.76     |
  throughput          | 1761.00  | 1761.00  | 1761.00  | 1761.00  | 1762.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.76     | 4.76     | 4.76     | 4.76     | 4.78     |
  throughput          | 1753.00  | 1761.00  | 1761.00  | 1761.00  | 1761.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.99     | 5.09     | 5.09     | 5.09     | 5.09     |
  throughput          | 1646.00  | 1646.00  | 1646.00  | 1647.00  | 1681.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.16     | 5.18     | 5.18     | 5.18     | 5.18     |
  throughput          | 1618.00  | 1618.00  | 1618.00  | 1618.00  | 1623.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.20     | 5.21     | 5.21     | 5.21     | 5.22     |
  throughput          | 1605.00  | 1608.00  | 1608.00  | 1608.00  | 1612.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.25     | 5.43     | 5.43     | 5.44     | 5.46     |
  throughput          | 1535.00  | 1542.00  | 1543.00  | 1543.00  | 1598.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
```

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  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.32     | 5.46     | 5.46     | 5.61     | 5.61     |
  throughput          | 1494.00  | 1495.00  | 1535.00  | 1535.00  | 1576.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - D-SACK
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 6.32, median: 6.32 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 5.51     | 5.51     | 5.51     | 5.51     |
  throughput          | 2282.00  | 2282.00  | 2282.00  | 2282.00  | 2283.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 4.78     | 4.78     | 4.78     | 4.78     |
  throughput          | 1753.00  | 1753.00  | 1753.00  | 1753.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 4.97     | 4.97     | 4.97     | 4.98     |
  throughput          | 1685.00  | 1685.00  | 1685.00  | 1685.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - D-SACK
Workload: m+8m
====================
Total time of a basic test: min: 16.09, max: 16.14, median: 16.10 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.14     | 6.15     | 6.15     | 6.15     | 6.15     |
  throughput          | 2045.00  | 2045.00  | 2046.00  | 2046.00  | 2049.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.35     | 4.36     | 4.39     | 4.40     |
  throughput          | 1905.00  | 1911.00  | 1922.00  | 1927.00  | 1927.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.20     | 5.20     | 5.20     | 5.20     | 5.20     |
  throughput          | 1613.00  | 1613.00  | 1613.00  | 1613.00  | 1613.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.38     | 5.38     | 5.38     | 5.38     | 5.38     |
  throughput          | 1558.00  | 1558.00  | 1558.00  | 1558.00  | 1558.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.38     | 5.38     | 5.38     | 5.38     | 5.39     |
  throughput          | 1557.00  | 1557.00  | 1558.00  | 1558.00  | 1558.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.40     | 5.40     | 5.40     | 5.40     | 5.40     |
  throughput          | 1552.00  | 1552.00  | 1552.00  | 1552.00  | 1552.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
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```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 5.59     | 5.59     | 5.59     | 5.60     |
  throughput          | 1497.00  | 1500.00  | 1501.00  | 1501.00  | 1507.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.60     | 5.60     | 5.60     | 5.60     | 5.60     |
  throughput          | 1496.00  | 1497.00  | 1497.00  | 1497.00  | 1497.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.02     | 6.03     | 6.03     | 6.03     | 6.03     |
  throughput          | 1392.00  | 1392.00  | 1392.00  | 1392.00  | 1392.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - D-SACK
Workload: l+8m
```

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====================
Total time of a basic test: min: 21.58, max: 21.61, median: 21.60 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 18.81    | 18.82    | 18.85    | 18.87    | 18.87    |
  throughput          | 3805.00  | 3805.00  | 3809.00  | 3814.00  | 3815.00  |
  rexmt data pkts     | 18.00    | 18.00    | 18.00    | 18.00    | 18.00    |
  duplicate acks      | 35.00    | 35.00    | 35.00    | 35.00    | 35.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 18.00    | 18.00    | 18.00    | 18.00    | 18.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 50.00    | 50.00    | 50.00    | 50.00    | 50.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.46     | 4.48     | 4.48     | 4.49     | 4.50     |
  throughput          | 1862.00  | 1869.00  | 1869.00  | 1870.00  | 1879.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.68     | 4.68     | 4.69     | 4.70     | 4.72     |
  throughput          | 1778.00  | 1783.00  | 1787.00  | 1790.00  | 1792.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.65     | 5.66     | 5.66     | 5.66     | 5.66     |
  throughput          | 1481.00  | 1481.00  | 1481.00  | 1481.00  | 1483.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.06     | 6.07     | 6.07     | 6.07     | 6.07     |
  throughput          | 1382.00  | 1382.00  | 1382.00  | 1382.00  | 1383.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.46     | 6.47     | 6.47     | 6.47     | 6.47     |
  throughput          | 1296.00  | 1296.00  | 1296.00  | 1296.00  | 1297.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 9.56     | 9.56     | 9.56     | 9.56     | 9.56     |
  throughput          | 877.00   | 877.00   | 877.00   | 877.00   | 877.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	9.57	9.57	9.57	9.57	9.57
throughput	876.00	876.00	876.00	876.00	876.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	13.75	13.76	13.76	13.78	13.78
throughput	608.00	608.00	609.00	609.00	610.00
rexmt data pkts	2.00	2.00	2.00	2.00	2.00
duplicate acks	6.00	6.00	6.00	6.00	6.00
triple dupacks	1.00	1.00	1.00	1.00	1.00
pkts dropped (q)	2.00	2.00	2.00	2.00	2.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	5.00	5.00	5.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

B.1.5 F-RTO

This sub subsection has the results of F-RTO tests.

```
OPTIMAL LINK - F-RTO
Workload: s+2s
====================
Total time of a basic test: min: 3.79, max: 3.79, median: 3.79 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.79     | 3.79     | 3.79     | 3.79     | 3.79     |
  throughput          | 1658.00  | 1659.00  | 1659.00  | 1659.00  | 1659.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.32     | 2.32     | 2.32     | 2.32     | 2.32     |
  throughput          | 905.00   | 905.00   | 905.00   | 905.00   | 905.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.32     | 2.32     | 2.32     | 2.32     | 2.32     |
  throughput          | 903.00   | 903.00   | 903.00   | 903.00   | 904.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - F-RTO
Workload: s+2m
====================
Total time of a basic test: min: 5.69, max: 5.70, median: 5.69 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 3.94     | 3.94     | 3.94     | 3.94     |
  throughput          | 1595.00  | 1597.00  | 1597.00  | 1597.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.16     | 4.16     | 4.16     | 4.16     | 4.31     |
  throughput          | 1946.00  | 2013.00  | 2016.00  | 2016.00  | 2016.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.35     | 4.35     | 4.35     | 4.35     |
  throughput          | 1927.00  | 1929.00  | 1929.00  | 1929.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - F-RTO
Workload: s+8m
====================
Total time of a basic test: min: 14.19, max: 14.45, median: 14.44 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.20     | 4.20     | 4.20     | 4.24     |
```

```
  throughput          | 1484.00  | 1496.00  | 1496.00  | 1496.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.57     | 4.57     | 4.57     | 4.57     | 4.57     |
  throughput          | 1833.00  | 1833.00  | 1833.00  | 1833.00  | 1833.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.76     | 4.76     | 4.76     | 4.76     | 4.76     |
  throughput          | 1761.00  | 1761.00  | 1761.00  | 1761.00  | 1761.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.76     | 4.76     | 4.77     | 4.78     | 4.98     |
  throughput          | 1685.00  | 1753.00  | 1757.00  | 1761.00  | 1761.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.98     | 4.99     | 5.09     | 5.10     | 5.10     |
  throughput          | 1645.00  | 1645.00  | 1645.00  | 1681.00  | 1682.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.05     | 5.16     | 5.18     | 5.18     | 5.18     |
  throughput          | 1618.00  | 1618.00  | 1618.00  | 1623.00  | 1661.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.16     | 5.20     | 5.21     | 5.21     | 5.21     |
  throughput          | 1608.00  | 1608.00  | 1608.00  | 1611.00  | 1625.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.20     | 5.25     | 5.43     | 5.44     | 5.46     |
  throughput          | 1535.00  | 1542.00  | 1543.00  | 1598.00  | 1613.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.32     | 5.32     | 5.46     | 5.61     | 5.61     |
  throughput          | 1493.00  | 1494.00  | 1535.00  | 1576.00  | 1577.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - F-RTO
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 6.32, median: 6.32 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 5.51     | 5.51     | 5.51     | 5.51     |
  throughput          | 2280.00  | 2281.00  | 2281.00  | 2281.00  | 2281.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 4.78     | 4.78     | 4.78     | 4.78     |
  throughput          | 1753.00  | 1753.00  | 1753.00  | 1753.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 4.97     | 4.97     | 4.97     | 4.98     |
  throughput          | 1685.00  | 1685.00  | 1685.00  | 1685.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - F-RTO
Workload: m+8m
====================
Total time of a basic test: min: 16.09, max: 16.14, median: 16.10 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.15     | 6.15     | 6.15     | 6.15     | 6.15     |
  throughput          | 2044.00  | 2044.00  | 2045.00  | 2045.00  | 2045.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.35     | 4.35     | 4.39     | 4.40     |
  throughput          | 1907.00  | 1909.00  | 1922.00  | 1927.00  | 1927.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.20     | 5.20     | 5.20     | 5.20     | 5.20     |
  throughput          | 1613.00  | 1613.00  | 1613.00  | 1613.00  | 1613.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.38     | 5.38     | 5.38     | 5.38     | 5.38     |
  throughput          | 1558.00  | 1558.00  | 1558.00  | 1558.00  | 1558.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.38     | 5.38     | 5.38     | 5.38     | 5.39     |
  throughput          | 1557.00  | 1558.00  | 1558.00  | 1558.00  | 1558.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.40     | 5.40     | 5.40     | 5.40     | 5.40     |
  throughput          | 1552.00  | 1552.00  | 1552.00  | 1552.00  | 1552.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 5.58     | 5.58     | 5.58     | 5.59     |
  throughput          | 1501.00  | 1502.00  | 1502.00  | 1502.00  | 1507.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.60     | 5.60     | 5.60     | 5.60     | 5.60     |
  throughput          | 1497.00  | 1497.00  | 1497.00  | 1497.00  | 1497.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.03     | 6.03     | 6.03     | 6.03     | 6.03     |
  throughput          | 1391.00  | 1392.00  | 1392.00  | 1392.00  | 1392.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

OPTIMAL LINK - F-RTO
Workload: l+8m
```

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====================
Total time of a basic test: min: 21.58, max: 21.61, median: 21.59 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 18.82    | 18.82    | 18.82    | 18.85    | 18.87    |
  throughput          | 3805.00  | 3809.00  | 3811.00  | 3815.00  | 3815.00  |
  rexmt data pkts     | 18.00    | 18.00    | 18.00    | 18.00    | 18.00    |
  duplicate acks      | 35.00    | 35.00    | 35.00    | 35.00    | 35.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 18.00    | 18.00    | 18.00    | 18.00    | 18.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 50.00    | 50.00    | 50.00    | 50.00    | 50.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.46     | 4.47     | 4.48     | 4.49     | 4.50     |
  throughput          | 1864.00  | 1868.00  | 1869.00  | 1875.00  | 1879.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.68     | 4.69     | 4.69     | 4.70     | 4.72     |
  throughput          | 1778.00  | 1783.00  | 1783.00  | 1788.00  | 1790.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.65     | 5.66     | 5.66     | 5.66     | 5.66     |
  throughput          | 1481.00  | 1481.00  | 1481.00  | 1481.00  | 1483.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 1.00     |
```

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  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.06     | 6.07     | 6.07     | 6.07     | 6.07     |
  throughput          | 1382.00  | 1382.00  | 1382.00  | 1382.00  | 1383.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.46     | 6.47     | 6.47     | 6.47     | 6.47     |
  throughput          | 1296.00  | 1296.00  | 1296.00  | 1296.00  | 1297.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 9.56     | 9.56     | 9.56     | 9.56     | 9.56     |
  throughput          | 877.00   | 877.00   | 877.00   | 877.00   | 877.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	9.57	9.57	9.57	9.57	9.57
throughput	876.00	876.00	876.00	876.00	876.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	13.75	13.76	13.76	13.78	13.79
throughput	608.00	609.00	609.00	609.00	610.00
rexmt data pkts	2.00	2.00	2.00	2.00	2.00
duplicate acks	6.00	6.00	6.00	6.00	6.00
triple dupacks	1.00	1.00	1.00	1.00	1.00
pkts dropped (q)	2.00	2.00	2.00	2.00	2.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	5.00	5.00	5.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

B.2 Tests with lossy link with low ARQ persistency

In this subsection we present the results of tests with a link capable of one retransmission.

B.2.1 Baseline TCP + TS

This sub subsection has the results of baseline TCP tests with TCP Timestamps option enabled.

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL+TS
Workload: s+2s
==========
Total time of a basic test: min: 3.85, max: 11.75, median: 5.78 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.85	4.46	5.16	6.14	10.39
throughput	605.00	1024.00	1208.00	1411.00	1635.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	1.00	2.00	2.00	3.00	8.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	6.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.32	2.33	2.91	3.73	6.16
throughput	340.00	561.00	693.00	899.00	903.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	2.00	2.00	2.00	5.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	3.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.33	2.34	3.05	4.38	8.66
throughput	242.00	479.00	619.00	896.00	900.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	1.00	2.00	2.00	2.00	5.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL+TS
Workload: s+2m
==========
Total time of a basic test: min: 5.77, max: 15.77, median: 7.91 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.98     | 4.67     | 4.91     | 6.45     | 11.64    |
  throughput          | 540.00   | 974.00   | 1256.00  | 1346.00  | 1578.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.31     | 4.83     | 5.60     | 6.29     | 9.82     |
  throughput          | 854.00   | 1332.00  | 1470.00  | 1737.00  | 1944.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.42     | 5.13     | 6.15     | 8.79     | 12.91    |
  throughput          | 650.00   | 953.00   | 1326.00  | 1635.00  | 1897.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 3.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 5.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL+TS
Workload: s+8m
====================
Total time of a basic test: min: 15.36, max: 36.15, median: 19.02 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.25     | 4.41     | 4.94     | 5.72     | 20.10    |
```

```
  throughput          | 313.00   | 1099.00  | 1271.00  | 1424.00  | 1478.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.24     | 4.64     | 4.92     | 5.14     | 6.03     |
  throughput          | 1391.00  | 1630.00  | 1695.00  | 1806.00  | 1976.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.54     | 4.99     | 5.31     | 5.65     | 6.25     |
  throughput          | 1341.00  | 1484.00  | 1564.00  | 1680.00  | 1848.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.64     | 5.29     | 5.52     | 6.06     | 7.73     |
  throughput          | 1084.00  | 1384.00  | 1509.00  | 1585.00  | 1808.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.46     | 6.01     | 7.01     | 9.46     |
  throughput          | 886.00   | 1197.00  | 1392.00  | 1536.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.33     | 5.83     | 6.49     | 8.07     | 12.04    |
  throughput          | 696.00   | 1039.00  | 1266.00  | 1437.00  | 1572.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 2.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.40     | 6.13     | 7.15     | 9.50     | 12.33    |
  throughput          | 680.00   | 883.00   | 1164.00  | 1369.00  | 1554.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 6.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 11.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.45     | 7.11     | 9.09     | 11.50    | 18.01    |
  throughput          | 465.00   | 729.00   | 876.00   | 1179.00  | 1538.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 6.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 5.00     | 10.00    |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 7.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 1.00     | 4.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.98     | 8.83     | 10.64    | 12.96    | 28.06    |
  throughput          | 299.00   | 647.00   | 786.00   | 950.00   | 1401.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 3.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 4.00     | 6.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 2.00     | 3.00     | 5.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 3.00     | 6.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL+TS
Workload: m+2m
====================
Total time of a basic test: min: 7.07, max: 23.45, median: 9.98 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.02     | 6.66     | 7.79     | 11.28    | 18.72    |
  throughput          | 672.00   | 1114.00  | 1614.00  | 1888.00  | 2090.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 7.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.51     | 5.42     | 5.86     | 6.81     | 13.37    |
  throughput          | 627.00   | 1232.00  | 1400.00  | 1546.00  | 1857.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 7.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.62     | 5.93     | 7.77     | 9.37     | 22.09    |
  throughput          | 379.00   | 895.00   | 1070.00  | 1413.00  | 1813.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 3.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 5.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 4.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL+TS
Workload: m+8m
====================
Total time of a basic test: min: 17.41, max: 36.04, median: 22.27 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.11     | 6.84     | 8.06     | 11.60    | 16.89    |
  throughput          | 745.00   | 1084.00  | 1559.00  | 1838.00  | 2059.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 6.00     | 13.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 12.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.99     | 4.34     | 4.84     | 5.29     | 9.41     |
  throughput          | 891.00   | 1584.00  | 1715.00  | 1933.00  | 2101.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.34	5.24	5.52	6.20	9.88
throughput	848.00	1353.00	1477.00	1600.00	1930.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	2.00	2.00	2.00	8.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.82	5.47	5.93	6.77	10.02
throughput	837.00	1238.00	1414.00	1531.00	1740.00
rexmt data pkts	0.00	0.00	0.00	0.00	3.00
duplicate acks	1.00	2.00	2.00	2.00	8.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	6.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.90	5.76	6.38	7.49	11.10
throughput	755.00	1120.00	1270.00	1456.00	1710.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	2.00	2.00	2.00	4.00	9.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	2.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.91	6.16	7.20	8.47	13.78
throughput	608.00	990.00	1162.00	1361.00	1707.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	1.00	2.00	2.00	7.00	10.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 6.38     | 7.83     | 9.30     | 14.01    |
  throughput          | 599.00   | 901.00   | 1048.00  | 1314.00  | 1523.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.55     | 6.90     | 8.86     | 10.68    | 19.54    |
  throughput          | 429.00   | 785.00   | 913.00   | 1216.00  | 1511.00  |
  rexmt data pkts     | 0.00     | 1.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 2.00     | 2.00     | 5.00     | 7.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 3.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 3.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.05     | 8.21     | 12.31    | 16.01    | 24.71    |
  throughput          | 339.00   | 524.00   | 681.00   | 1022.00  | 1385.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 3.00     | 5.00     |
  duplicate acks      | 2.00     | 3.00     | 4.00     | 6.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 2.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 3.00     | 5.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL+TS
Workload: l+8m
```

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====================
Total time of a basic test: min: 24.11, max: 62.36, median: 34.37 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 19.93    | 25.45    | 31.77    | 38.12    | 62.36    |
  throughput          | 1151.00  | 1883.00  | 2231.00  | 2821.00  | 3603.00  |
  rexmt data pkts     | 2.00     | 3.00     | 8.00     | 10.00    | 30.00    |
  duplicate acks      | 11.00    | 21.00    | 25.00    | 35.00    | 61.00    |
  triple dupacks      | 1.00     | 2.00     | 2.00     | 3.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 3.00     | 16.00    |
  pkts dropped (e)    | 0.00     | 1.00     | 6.00     | 9.00     | 14.00    |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 11.00    | 22.00    | 32.00    | 42.00    | 62.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 2.00     | 5.00     | 13.00    |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.94     | 5.58     | 6.46     | 7.87     |
  throughput          | 1065.00  | 1298.00  | 1482.00  | 1697.00  | 1928.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.93     | 5.87     | 6.18     | 7.28     | 8.70     |
  throughput          | 964.00   | 1152.00  | 1355.00  | 1429.00  | 1699.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.64     | 6.37     | 6.86     | 7.65     | 10.25    |
  throughput          | 818.00   | 1097.00  | 1206.00  | 1317.00  | 1487.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 10.00    |
```

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  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.00     | 7.21     | 7.66     | 8.47     | 11.34    |
  throughput          | 739.00   | 990.00   | 1085.00  | 1163.00  | 1397.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.91     | 7.93     | 8.61     | 10.58    | 13.34    |
  throughput          | 629.00   | 793.00   | 958.00   | 1058.00  | 1214.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 4.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 2.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.01     | 8.83     | 9.53     | 12.32    | 13.98    |
  throughput          | 600.00   | 680.00   | 875.00   | 949.00   | 1196.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 8.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 2.00     | 5.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.12	9.52	11.17	14.04	18.07
throughput	464.00	597.00	742.00	881.00	1177.00
rexmt data pkts	0.00	1.00	1.00	2.00	5.00
duplicate acks	2.00	3.00	4.00	7.00	12.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	1.00
pkts dropped (e)	0.00	1.00	1.00	2.00	5.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	2.00	5.00	9.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.15	12.23	14.54	18.60	29.48
throughput	284.00	451.00	530.00	686.00	1172.00
rexmt data pkts	0.00	2.00	3.00	3.00	5.00
duplicate acks	1.00	2.00	3.00	6.00	9.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	2.00
pkts dropped (e)	0.00	1.00	2.00	3.00	5.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	2.00	6.00	9.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	1.00	1.00	6.00

B.2.2 IW4 + TS

This sub subsection has the results of Initial Window of four segments tests with TCP Timestamps option enabled.

LOSSY LINK WITH LOW ARQ PERSISTENCY - IW4
Workload: s+2s
==========
Total time of a basic test: min: 3.39, max: 10.17, median: 4.05 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.39	3.40	4.05	5.05	9.72
throughput	647.00	1245.00	1552.00	1849.00	1853.00
rexmt data pkts	0.00	0.00	0.00	0.00	4.00
duplicate acks	0.00	1.00	1.00	2.00	8.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	8.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	1.63	1.63	1.63	2.29	5.94
throughput	353.00	917.00	1286.00	1288.00	1290.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	0.00	1.00	1.00	1.00	6.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	4.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	1.89	1.90	1.90	2.60	8.82
throughput	238.00	807.00	1105.00	1105.00	1109.00
rexmt data pkts	0.00	0.00	0.00	0.00	4.00
duplicate acks	0.00	1.00	1.00	1.00	5.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	4.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	4.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

LOSSY LINK WITH LOW ARQ PERSISTENCY - IW4
Workload: s+2m
==========
Total time of a basic test: min: 5.16, max: 21.78, median: 7.92 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.38     | 3.38     | 4.08     | 6.46     | 15.25    |
  throughput          | 412.00   | 973.00   | 1540.00  | 1859.00  | 1859.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.24     | 4.00     | 4.38     | 5.47     | 14.34    |
  throughput          | 585.00   | 1533.00  | 1888.00  | 2096.00  | 2590.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.81     | 4.70     | 5.88     | 7.99     | 19.73    |
  throughput          | 425.00   | 1050.00  | 1415.00  | 1784.00  | 2203.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 5.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - IW4
Workload: s+8m
====================
Total time of a basic test: min: 14.64, max: 29.12, median: 18.36 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.29     | 4.38     | 6.23     | 7.61     | 13.89    |
```

```
  throughput          | 453.00   | 827.00   | 996.00   | 1435.00  | 1912.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 5.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 6.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.25     | 3.84     | 4.08     | 4.53     | 5.35     |
  throughput          | 1568.00  | 1850.00  | 2029.00  | 2185.00  | 2576.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.48     | 4.31     | 4.64     | 4.93     | 6.23     |
  throughput          | 1345.00  | 1700.00  | 1789.00  | 1945.00  | 2408.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 4.75     | 5.00     | 5.28     | 6.42     |
  throughput          | 1306.00  | 1589.00  | 1641.00  | 1767.00  | 2126.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.97     | 5.09     | 5.60     | 6.33     | 7.41     |
  throughput          | 1131.00  | 1324.00  | 1494.00  | 1647.00  | 2109.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 7.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.70     | 5.60     | 6.17     | 7.24     | 10.82    |
  throughput          | 775.00   | 1157.00  | 1356.00  | 1498.00  | 1785.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 7.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.02     | 5.90     | 7.09     | 9.19     | 13.45    |
  throughput          | 624.00   | 912.00   | 1149.00  | 1422.00  | 1671.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 0.00     | 1.00     | 3.00     | 7.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 4.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.57     | 6.68     | 8.68     | 10.64    | 14.91    |
  throughput          | 562.00   | 788.00   | 960.00   | 1255.00  | 1505.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 2.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 4.00     | 7.00     | 11.00    |
```

```
  triple dupacks      | 0.00     | 0.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 5.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.66     | 8.67     | 11.16    | 13.25    | 19.57    |
  throughput          | 428.00   | 633.00   | 709.00   | 967.00   | 1482.00  |
  rexmt data pkts     | 0.00     | 1.00     | 3.00     | 3.00     | 7.00     |
  duplicate acks      | 0.00     | 2.00     | 4.00     | 7.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 2.00     | 3.00     | 6.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 1.00     | 4.00     | 6.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - IW4
Workload: m+2m
====================
Total time of a basic test: min: 5.98, max: 21.12, median: 7.69 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.09     | 5.33     | 5.80     | 7.57     | 21.12    |
  throughput          | 596.00   | 1660.00  | 2169.00  | 2361.00  | 2470.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 2.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 7.00     | 14.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 7.00     | 12.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.95     | 4.20     | 4.78     | 5.52     | 8.44     |
  throughput          | 993.00   | 1518.00  | 1753.00  | 1996.00  | 2120.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.63     | 4.86     | 5.37     | 7.86     | 16.84    |
  throughput          | 498.00   | 1066.00  | 1466.00  | 1726.00  | 1811.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 6.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - IW4
Workload: m+8m
====================
Total time of a basic test: min: 15.63, max: 37.11, median: 19.57 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.83     | 6.05     | 7.73     | 10.90    | 26.71    |
  throughput          | 471.00   | 1154.00  | 1597.00  | 2078.00  | 2158.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 8.00     | 14.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 8.00     | 13.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.26     | 3.49     | 3.89     | 4.14     | 5.11     |
  throughput          | 1639.00  | 2027.00  | 2135.00  | 2401.00  | 2574.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.41	4.43	4.75	5.15	5.93
throughput	1414.00	1627.00	1756.00	1893.00	2456.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	1.00	1.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.57	4.84	5.22	5.89	7.32
throughput	1145.00	1423.00	1578.00	1731.00	2346.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	1.00	2.00	10.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	8.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.96	5.24	5.94	6.95	8.32
throughput	1008.00	1207.00	1372.00	1601.00	2120.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	1.00	1.00	2.00	2.00	11.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	9.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.32	6.03	6.41	7.94	11.06
throughput	758.00	1056.00	1234.00	1390.00	1940.00
rexmt data pkts	0.00	0.00	1.00	2.00	3.00
duplicate acks	1.00	1.00	2.00	7.00	10.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 7.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.23     | 6.28     | 7.37     | 8.78     | 12.90    |
  throughput          | 650.00   | 955.00   | 1099.00  | 1335.00  | 1602.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 3.00     | 7.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 5.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 3.00     | 6.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.28     | 7.94     | 9.01     | 10.76    | 19.28    |
  throughput          | 435.00   | 779.00   | 920.00   | 1056.00  | 1588.00  |
  rexmt data pkts     | 0.00     | 1.00     | 1.00     | 2.00     | 5.00     |
  duplicate acks      | 0.00     | 2.00     | 6.00     | 8.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 1.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 5.00     | 7.00     | 11.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 4.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.09     | 10.62    | 11.49    | 14.00    | 25.52    |
  throughput          | 329.00   | 599.00   | 713.00   | 790.00   | 1377.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 3.00     | 8.00     |
  duplicate acks      | 1.00     | 2.00     | 4.00     | 7.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 2.00     | 3.00     | 6.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 1.00     | 5.00     | 7.00     | 10.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 4.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - IW4
Workload: l+8m
```

```
====================
Total time of a basic test: min: 24.09, max: 63.37, median: 33.55 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 19.61    | 27.88    | 32.17    | 39.34    | 63.37    |
  throughput          | 1133.00  | 1825.00  | 2223.00  | 2575.00  | 3660.00  |
  rexmt data pkts     | 1.00     | 6.00     | 8.00     | 11.00    | 25.00    |
  duplicate acks      | 17.00    | 24.00    | 27.00    | 35.00    | 47.00    |
  triple dupacks      | 1.00     | 2.00     | 3.00     | 3.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 2.00     | 19.00    |
  pkts dropped (e)    | 0.00     | 5.00     | 7.00     | 9.00     | 12.00    |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 19.00    | 29.00    | 34.00    | 38.00    | 50.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 2.00     | 2.00     | 3.00     | 9.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.25     | 3.65     | 4.21     | 4.90     | 6.29     |
  throughput          | 1332.00  | 1710.00  | 1982.00  | 2295.00  | 2578.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 1.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.87     | 4.68     | 5.01     | 5.80     | 7.32     |
  throughput          | 1145.00  | 1445.00  | 1621.00  | 1791.00  | 2165.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.00     | 5.07     | 5.96     | 6.64     | 8.38     |
  throughput          | 1000.00  | 1263.00  | 1398.00  | 1654.00  | 2096.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 7.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.61     | 5.93     | 6.59     | 7.73     | 9.43     |
  throughput          | 889.00   | 1084.00  | 1262.00  | 1414.00  | 1817.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 4.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.22     | 6.22     | 7.10     | 8.62     | 15.59    |
  throughput          | 538.00   | 972.00   | 1119.00  | 1348.00  | 1606.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 6.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.42     | 7.45     | 8.12     | 9.88     | 18.75    |
  throughput          | 447.00   | 848.00   | 920.00   | 1126.00  | 1546.00  |
  rexmt data pkts     | 0.00     | 1.00     | 1.00     | 3.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 4.00     | 8.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 3.00     | 7.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.93	8.40	10.26	13.59	18.93
throughput	443.00	617.00	805.00	998.00	1413.00
rexmt data pkts	0.00	1.00	1.00	2.00	4.00
duplicate acks	1.00	2.00	3.00	6.00	12.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	2.00
pkts dropped (e)	0.00	1.00	1.00	2.00	4.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	2.00	6.00	11.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	6.98	11.88	14.98	17.81	35.67
throughput	235.00	471.00	539.00	706.00	1202.00
rexmt data pkts	1.00	1.00	2.00	4.00	6.00
duplicate acks	1.00	1.00	5.00	6.00	12.00
triple dupacks	0.00	0.00	1.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	1.00	3.00
pkts dropped (e)	0.00	0.00	1.00	3.00	6.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	4.00	6.00	11.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

B.2.3 Baseline TCP - TS

This sub subsection has the results of baseline TCP tests with TCP Timestamps option disabled.

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL-TS
Workload: s+2s
==========
Total time of a basic test: min: 3.79, max: 13.44, median: 5.44 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.79	4.37	4.53	6.06	9.86
throughput	638.00	1038.00	1357.00	1440.00	1659.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	1.00	2.00	2.00	2.00	7.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	4.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	6.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.16	2.32	2.81	3.16	7.02
throughput	298.00	664.00	742.00	905.00	970.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.32	2.32	3.02	5.15	12.10
throughput	173.00	407.00	694.00	903.00	905.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	2.00	2.00	2.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL-TS
Workload: s+2m
==========
Total time of a basic test: min: 5.69, max: 17.59, median: 8.32 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 3.94     | 4.64     | 7.80     | 11.52    |
  throughput          | 546.00   | 806.00   | 1355.00  | 1597.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.12     | 4.81     | 5.06     | 6.63     | 12.93    |
  throughput          | 649.00   | 1265.00  | 1625.00  | 1745.00  | 2033.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.98     | 6.84     | 8.77     | 15.38    |
  throughput          | 545.00   | 956.00   | 1206.00  | 1682.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 6.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 4.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL-TS
Workload: s+8m
====================
Total time of a basic test: min: 15.27, max: 30.83, median: 20.98 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.21     | 4.94     | 7.70     | 13.21    |
```

```
  throughput          | 476.00   | 817.00   | 1176.00  | 1495.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 4.57     | 4.99     | 5.35     | 7.80     |
  throughput          | 1075.00  | 1567.00  | 1676.00  | 1833.00  | 2129.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.43     | 4.76     | 5.17     | 5.81     | 7.93     |
  throughput          | 1058.00  | 1444.00  | 1559.00  | 1761.00  | 1892.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.56     | 5.18     | 5.52     | 6.45     | 8.40     |
  throughput          | 998.00   | 1300.00  | 1506.00  | 1618.00  | 1837.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.84     | 5.50     | 6.33     | 8.32     | 9.34     |
  throughput          | 897.00   | 1008.00  | 1299.00  | 1524.00  | 1731.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 5.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.06     | 6.20     | 7.20     | 8.93     | 10.32    |
  throughput          | 812.00   | 939.00   | 1106.00  | 1352.00  | 1657.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.66     | 6.88     | 8.17     | 10.53    | 13.07    |
  throughput          | 642.00   | 796.00   | 974.00   | 1219.00  | 1482.00  |
  rexmt data pkts     | 0.00     | 1.00     | 1.00     | 2.00     | 6.00     |
  duplicate acks      | 0.00     | 2.00     | 5.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 1.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 1.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 4.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.91     | 8.18     | 9.95     | 12.65    | 18.68    |
  throughput          | 449.00   | 663.00   | 820.00   | 1025.00  | 1418.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 2.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 5.00     | 9.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 1.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 2.00     | 4.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.00     | 8.62     | 11.11    | 15.58    | 24.21    |
  throughput          | 346.00   | 538.00   | 712.00   | 973.00   | 1398.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 3.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 3.00     | 6.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 2.00     | 3.00     | 6.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 2.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL-TS
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 16.52, median: 9.24 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.20     | 6.22     | 7.18     | 10.07    | 14.50    |
  throughput          | 867.00   | 1249.00  | 1733.00  | 2023.00  | 2417.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 5.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 4.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 2.00     | 11.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 5.18     | 5.47     | 6.78     | 10.31    |
  throughput          | 813.00   | 1236.00  | 1529.00  | 1620.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.58     | 6.51     | 9.21     | 15.17    |
  throughput          | 553.00   | 910.00   | 1284.00  | 1503.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 1.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL-TS
Workload: m+8m
====================
Total time of a basic test: min: 15.94, max: 35.58, median: 20.25 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.14     | 6.63     | 7.92     | 12.65    | 19.98    |
  throughput          | 630.00   | 994.00   | 1534.00  | 1898.00  | 2047.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 7.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 7.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 12.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.95     | 4.27     | 4.67     | 5.06     | 6.00     |
  throughput          | 1398.00  | 1659.00  | 1768.00  | 1961.00  | 2125.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.07	4.97	5.40	5.70	6.92
throughput	1212.00	1471.00	1520.00	1686.00	2060.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.63	5.29	5.79	6.16	8.29
throughput	1012.00	1362.00	1444.00	1586.00	1811.00
rexmt data pkts	0.00	0.00	0.00	0.00	3.00
duplicate acks	1.00	1.00	2.00	2.00	9.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	6.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.78	5.61	6.23	7.00	11.00
throughput	762.00	1198.00	1346.00	1496.00	1754.00
rexmt data pkts	0.00	0.00	0.00	1.00	4.00
duplicate acks	1.00	1.00	2.00	3.00	8.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	4.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	2.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.01	6.08	6.49	7.70	13.08
throughput	641.00	1089.00	1281.00	1379.00	1673.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	0.00	1.00	2.00	2.00	10.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.06     | 6.48     | 7.31     | 9.46     | 14.41    |
  throughput          | 582.00   | 886.00   | 1064.00  | 1294.00  | 1384.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 7.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.22     | 7.26     | 8.72     | 12.17    | 14.65    |
  throughput          | 572.00   | 689.00   | 916.00   | 1155.00  | 1347.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 1.00     | 4.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.29     | 9.04     | 11.12    | 13.90    | 25.16    |
  throughput          | 333.00   | 603.00   | 705.00   | 928.00   | 1333.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 3.00     | 7.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 6.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 1.00     | 3.00     | 7.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 3.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - BL-TS
Workload: l+8m
```

```
====================
Total time of a basic test: min: 23.05, max: 187.17, median: 31.38 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 19.02    | 22.21    | 28.34    | 40.37    | 103.86   |
  throughput          | 691.00   | 1778.00  | 2489.00  | 3233.00  | 3775.00  |
  rexmt data pkts     | 1.00     | 6.00     | 11.00    | 16.00    | 25.00    |
  duplicate acks      | 9.00     | 20.00    | 31.00    | 38.00    | 58.00    |
  triple dupacks      | 1.00     | 1.00     | 2.00     | 3.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 14.00    | 20.00    |
  pkts dropped (e)    | 0.00     | 2.00     | 5.00     | 9.00     | 16.00    |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 13.00    | 26.00    | 39.00    | 48.00    | 63.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 3.00     | 5.00     | 10.00    |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.01     | 4.74     | 5.14     | 6.07     | 7.33     |
  throughput          | 1144.00  | 1382.00  | 1593.00  | 1768.00  | 2092.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.83     | 5.38     | 6.07     | 6.64     | 8.07     |
  throughput          | 1039.00  | 1262.00  | 1369.00  | 1560.00  | 1738.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.87     | 6.19     | 6.95     | 8.06     | 10.09    |
  throughput          | 831.00   | 1040.00  | 1183.00  | 1354.00  | 1722.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 9.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.40     | 6.95     | 8.09     | 9.02     | 13.29    |
  throughput          | 631.00   | 930.00   | 1009.00  | 1207.00  | 1553.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 5.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.43     | 7.48     | 9.21     | 10.24    | 13.32    |
  throughput          | 629.00   | 819.00   | 891.00   | 1120.00  | 1304.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.14     | 8.92     | 9.95     | 12.28    | 17.85    |
  throughput          | 470.00   | 683.00   | 830.00   | 940.00   | 1175.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 5.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.18	9.84	12.92	15.98	20.51
throughput	409.00	525.00	646.00	852.00	1168.00
rexmt data pkts	0.00	1.00	2.00	3.00	5.00
duplicate acks	1.00	2.00	3.00	6.00	10.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	2.00
pkts dropped (e)	0.00	0.00	1.00	2.00	4.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	3.00	5.00	8.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.87	11.81	16.03	19.00	180.16
throughput	47.00	441.00	522.00	710.00	945.00
rexmt data pkts	0.00	2.00	3.00	4.00	10.00
duplicate acks	1.00	3.00	4.00	6.00	10.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	3.00
pkts dropped (e)	0.00	1.00	1.00	3.00	8.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	3.00	6.00	9.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

B.2.4 F-RTO

This sub subsection has the results of F-RTO tests.

LOSSY LINK WITH LOW ARQ PERSISTENCY - F-RTO
Workload: s+2s
==========
Total time of a basic test: min: 3.79, max: 14.24, median: 6.19 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.79	4.49	5.19	6.40	10.68
throughput	589.00	983.00	1211.00	1400.00	1659.00
rexmt data pkts	0.00	0.00	0.00	1.00	3.00
duplicate acks	1.00	2.00	2.00	2.00	6.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.25	2.32	2.88	3.11	6.60
throughput	317.00	673.00	728.00	905.00	930.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	2.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.32	2.32	3.02	6.33	12.89
throughput	163.00	331.00	694.00	902.00	905.00
rexmt data pkts	0.00	0.00	0.00	1.00	2.00
duplicate acks	1.00	2.00	2.00	2.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

LOSSY LINK WITH LOW ARQ PERSISTENCY - F-RTO
Workload: s+2m
==========
Total time of a basic test: min: 5.69, max: 15.43, median: 9.57 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 3.94     | 4.64     | 6.65     | 11.87    |
  throughput          | 530.00   | 945.00   | 1346.00  | 1597.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.16     | 4.81     | 4.94     | 6.41     | 11.92    |
  throughput          | 704.00   | 1308.00  | 1686.00  | 1743.00  | 2016.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 5.11     | 7.92     | 8.63     | 14.08    |
  throughput          | 596.00   | 972.00   | 1043.00  | 1641.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 6.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - F-RTO
Workload: s+8m
====================
Total time of a basic test: min: 14.83, max: 28.71, median: 19.85 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.46     | 5.60     | 8.20     | 14.84    |
```

```
  throughput          | 424.00   | 767.00   | 1049.00  | 1409.00  | 1498.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.06     | 4.42     | 4.81     | 5.16     | 6.14     |
  throughput          | 1366.00  | 1624.00  | 1706.00  | 1896.00  | 2065.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.43     | 5.02     | 5.24     | 5.60     | 6.68     |
  throughput          | 1255.00  | 1497.00  | 1590.00  | 1671.00  | 1890.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.63     | 5.18     | 5.42     | 5.95     | 9.91     |
  throughput          | 846.00   | 1410.00  | 1545.00  | 1618.00  | 1809.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.95     | 5.29     | 5.62     | 6.37     | 10.46    |
  throughput          | 802.00   | 1315.00  | 1473.00  | 1585.00  | 1695.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 5.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 4.00     | 10.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.17     | 5.53     | 6.27     | 7.44     | 11.34    |
  throughput          | 739.00   | 1127.00  | 1267.00  | 1516.00  | 1621.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 5.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 10.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.39     | 6.06     | 7.23     | 9.17     | 13.79    |
  throughput          | 608.00   | 914.00   | 1144.00  | 1384.00  | 1555.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 3.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 3.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 2.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.63     | 6.90     | 8.95     | 10.94    | 18.33    |
  throughput          | 457.00   | 766.00   | 918.00   | 1214.00  | 1489.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 4.00     | 6.00     | 10.00    |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 4.00     | 6.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.85     | 8.68     | 11.56    | 14.39    | 24.20    |
  throughput          | 347.00   | 582.00   | 708.00   | 966.00   | 1433.00  |
  rexmt data pkts     | 0.00     | 0.00     | 2.00     | 3.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 5.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 3.00     | 5.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 1.00     | 4.00     | 12.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - F-RTO
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 15.65, median: 8.24 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 5.72     | 6.72     | 7.69     | 15.56    |
  throughput          | 808.00   | 1636.00  | 1848.00  | 2197.00  | 2283.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 4.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 6.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 11.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 5.06     | 5.43     | 6.25     | 9.80     |
  throughput          | 856.00   | 1342.00  | 1543.00  | 1656.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.42     | 6.46     | 9.63     | 14.30    |
  throughput          | 586.00   | 871.00   | 1260.00  | 1547.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 2.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - F-RTO
Workload: m+8m
====================
Total time of a basic test: min: 16.87, max: 36.19, median: 20.94 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.13     | 6.79     | 7.53     | 11.18    | 16.42    |
  throughput          | 766.00   | 1125.00  | 1623.00  | 1852.00  | 2051.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 6.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 4.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 11.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.14     | 4.71     | 5.13     | 5.51     | 6.85     |
  throughput          | 1225.00  | 1523.00  | 1624.00  | 1780.00  | 2026.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.38	5.24	5.59	6.04	7.52
throughput	1115.00	1388.00	1494.00	1600.00	1913.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	2.00	2.00	5.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	3.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.74	5.45	5.80	6.28	9.81
throughput	854.00	1336.00	1438.00	1539.00	1769.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	1.00	2.00	2.00	9.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.84	6.03	6.28	6.94	10.55
throughput	794.00	1208.00	1331.00	1391.00	1731.00
rexmt data pkts	0.00	0.00	0.00	1.00	2.00
duplicate acks	1.00	2.00	2.00	5.00	10.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	3.00	8.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.94	6.13	6.85	8.32	11.51
throughput	728.00	1008.00	1209.00	1368.00	1697.00
rexmt data pkts	0.00	0.00	0.00	1.00	2.00
duplicate acks	1.00	2.00	2.00	3.00	9.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 1.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.20     | 6.85     | 7.63     | 9.30     | 12.28    |
  throughput          | 683.00   | 901.00   | 1097.00  | 1223.00  | 1353.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 5.00     |
  duplicate acks      | 0.00     | 2.00     | 3.00     | 6.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 5.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 2.00     | 5.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.37     | 7.63     | 8.88     | 11.80    | 12.67    |
  throughput          | 662.00   | 710.00   | 859.00   | 1099.00  | 1317.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 5.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 4.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.97     | 9.67     | 12.27    | 13.47    | 25.34    |
  throughput          | 331.00   | 622.00   | 676.00   | 867.00   | 1204.00  |
  rexmt data pkts     | 0.00     | 1.00     | 2.00     | 3.00     | 7.00     |
  duplicate acks      | 1.00     | 3.00     | 5.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 1.00     | 2.00     | 3.00     | 5.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 4.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |

LOSSY LINK WITH LOW ARQ PERSISTENCY - F-RTO
Workload: l+8m
```

```
====================
Total time of a basic test: min: 22.45, max: 49.55, median: 36.35 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 19.49    | 25.68    | 33.60    | 41.23    | 49.55    |
  throughput          | 1449.00  | 1741.00  | 2028.00  | 2796.00  | 3683.00  |
  rexmt data pkts     | 1.00     | 6.00     | 7.00     | 12.00    | 25.00    |
  duplicate acks      | 4.00     | 16.00    | 27.00    | 33.00    | 48.00    |
  triple dupacks      | 1.00     | 2.00     | 2.00     | 3.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 21.00    |
  pkts dropped (e)    | 0.00     | 4.00     | 6.00     | 8.00     | 12.00    |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 3.00     | 19.00    | 32.00    | 43.00    | 58.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 2.00     | 3.00     | 4.00     | 9.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.01     | 4.77     | 5.04     | 5.90     | 6.68     |
  throughput          | 1255.00  | 1421.00  | 1642.00  | 1757.00  | 2089.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 0.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.25     | 5.32     | 5.83     | 6.53     | 8.05     |
  throughput          | 1041.00  | 1284.00  | 1432.00  | 1576.00  | 1973.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.38     | 6.06     | 6.52     | 7.17     | 8.99     |
  throughput          | 933.00   | 1169.00  | 1266.00  | 1383.00  | 1558.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 2.00     | 9.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 6.36     | 6.90     | 8.09     | 10.74    |
  throughput          | 780.00   | 1037.00  | 1207.00  | 1318.00  | 1507.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.69     | 6.78     | 7.37     | 9.42     | 12.28    |
  throughput          | 682.00   | 890.00   | 1098.00  | 1236.00  | 1475.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 2.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.75     | 7.60     | 8.65     | 10.99    | 18.14    |
  throughput          | 462.00   | 763.00   | 963.00   | 1104.00  | 1457.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 6.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	6.21	8.58	9.79	12.52	19.75
throughput	424.00	670.00	773.00	977.00	1349.00
rexmt data pkts	0.00	0.00	1.00	2.00	5.00
duplicate acks	1.00	2.00	4.00	6.00	10.00
triple dupacks	0.00	0.00	1.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	1.00
pkts dropped (e)	0.00	0.00	1.00	2.00	4.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	3.00	5.00	10.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	2.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.53	10.28	13.88	17.57	32.31
throughput	259.00	477.00	581.00	816.00	1113.00
rexmt data pkts	0.00	1.00	2.00	3.00	5.00
duplicate acks	1.00	3.00	4.00	6.00	11.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	2.00
pkts dropped (e)	0.00	1.00	1.00	2.00	4.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	2.00	5.00	10.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

B.3 Tests with lossy link with medium ARQ persistency

In this subsection we present the results of tests with a link capable of two retransmissions.

B.3.1 Baseline TCP + TS

This sub subsection has the results of baseline TCP tests with TCP Timestamps option enabled.

```
LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - BL+TS
Workload: s+2s
====================
Total time of a basic test: min: 3.85, max: 11.78, median: 5.32 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.85     | 4.55     | 5.25     | 6.64     | 11.78    |
  throughput          | 534.00   | 947.00   | 1196.00  | 1383.00  | 1635.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.20     | 2.32     | 3.03     | 3.84     | 9.24     |
  throughput          | 227.00   | 546.00   | 669.00   | 902.00   | 951.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.33     | 2.34     | 3.25     | 4.31     | 9.41     |
  throughput          | 223.00   | 486.00   | 575.00   | 897.00   | 900.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - BL+TS
Workload: s+2m
====================
Total time of a basic test: min: 5.77, max: 12.75, median: 7.58 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.98     | 4.00     | 5.33     | 6.02     | 8.90     |
  throughput          | 707.00   | 1044.00  | 1169.00  | 1571.00  | 1578.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.01     | 4.97     | 5.65     | 6.10     | 10.37    |
  throughput          | 808.00   | 1373.00  | 1472.00  | 1688.00  | 2090.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.42     | 5.13     | 5.82     | 6.85     | 11.40    |
  throughput          | 735.00   | 1223.00  | 1438.00  | 1635.00  | 1896.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - BL+TS
Workload: s+8m
====================
Total time of a basic test: min: 15.75, max: 23.65, median: 19.18 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.25     | 4.48     | 5.55     | 6.70     | 14.74    |
```

```
  throughput          | 427.00   | 939.00   | 1113.00  | 1405.00  | 1480.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.54     | 5.01     | 5.19     | 5.79     | 6.74     |
  throughput          | 1245.00  | 1448.00  | 1606.00  | 1673.00  | 1848.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.08     | 5.51     | 5.82     | 6.32     | 7.53     |
  throughput          | 1113.00  | 1326.00  | 1430.00  | 1522.00  | 1649.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.19     | 5.77     | 6.15     | 6.72     | 7.83     |
  throughput          | 1070.00  | 1247.00  | 1361.00  | 1453.00  | 1616.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.33     | 5.97     | 6.39     | 6.91     | 8.10     |
  throughput          | 1035.00  | 1214.00  | 1291.00  | 1404.00  | 1573.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.46     | 6.36     | 6.77     | 7.54     | 9.12     |
  throughput          | 920.00   | 1111.00  | 1237.00  | 1319.00  | 1535.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.62     | 6.53     | 7.23     | 8.28     | 9.21     |
  throughput          | 910.00   | 1012.00  | 1141.00  | 1284.00  | 1491.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.63     | 6.61     | 7.68     | 8.84     | 11.97    |
  throughput          | 700.00   | 948.00   | 1080.00  | 1268.00  | 1489.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 4.00     | 7.00     |
```

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  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.74     | 6.97     | 8.12     | 10.76    | 14.30    |
  throughput          | 586.00   | 779.00   | 1027.00  | 1203.00  | 1461.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 3.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - BL+TS
Workload: m+2m
====================
Total time of a basic test: min: 6.44, max: 13.30, median: 7.92 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 6.26     | 6.96     | 8.17     | 10.14    |
  throughput          | 1240.00  | 1539.00  | 1804.00  | 2009.00  | 2262.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 13.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 11.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.61     | 5.95     | 7.00     | 8.54     |
  throughput          | 982.00   | 1199.00  | 1365.00  | 1496.00  | 1687.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.08     | 5.71     | 6.22     | 7.65     | 11.95    |
  throughput          | 701.00   | 1096.00  | 1315.00  | 1468.00  | 1649.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - BL+TS
Workload: m+8m
====================
Total time of a basic test: min: 17.05, max: 25.74, median: 19.92 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.19     | 7.26     | 7.70     | 8.63     | 11.31    |
  throughput          | 1112.00  | 1457.00  | 1610.00  | 1731.00  | 2030.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.16     | 4.88     | 5.30     | 5.72     | 6.92     |
  throughput          | 1212.00  | 1466.00  | 1554.00  | 1718.00  | 2014.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.85	5.54	5.98	6.28	7.33
throughput	1144.00	1336.00	1378.00	1513.00	1728.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	2.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.17	5.79	6.24	6.70	8.26
throughput	1015.00	1252.00	1343.00	1448.00	1622.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	2.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.22	6.15	6.37	7.22	8.56
throughput	980.00	1162.00	1295.00	1363.00	1605.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.53	6.36	6.76	7.54	10.20
throughput	822.00	1111.00	1236.00	1318.00	1516.00
rexmt data pkts	0.00	0.00	0.00	1.00	1.00
duplicate acks	2.00	2.00	2.00	3.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.16     | 6.69     | 7.08     | 7.78     | 11.27    |
  throughput          | 744.00   | 1078.00  | 1176.00  | 1252.00  | 1360.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.16     | 6.96     | 7.27     | 7.99     | 14.81    |
  throughput          | 566.00   | 1050.00  | 1140.00  | 1204.00  | 1360.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.17     | 7.21     | 8.45     | 10.38    | 18.44    |
  throughput          | 455.00   | 808.00   | 969.00   | 1164.00  | 1359.00  |
  rexmt data pkts     | 0.00     | 1.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 7.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - BL+TS
Workload: l+8m
```

```
====================
Total time of a basic test: min: 24.55, max: 43.88, median: 29.01 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 20.96    | 22.07    | 23.67    | 25.80    | 29.01    |
  throughput          | 2475.00  | 2782.00  | 2977.00  | 3252.00  | 3425.00  |
  rexmt data pkts     | 1.00     | 3.00     | 15.00    | 18.00    | 20.00    |
  duplicate acks      | 18.00    | 28.00    | 33.00    | 37.00    | 54.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 15.00    | 17.00    | 20.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 2.00     | 3.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 16.00    | 32.00    | 45.00    | 51.00    | 53.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.10     | 5.59     | 6.13     | 7.04     | 9.67     |
  throughput          | 867.00   | 1191.00  | 1311.00  | 1501.00  | 2044.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.98     | 6.19     | 7.17     | 7.71     | 12.29    |
  throughput          | 682.00   | 1088.00  | 1162.00  | 1355.00  | 1684.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.10     | 7.32     | 7.70     | 8.38     | 12.29    |
  throughput          | 682.00   | 1001.00  | 1060.00  | 1146.00  | 1644.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.36     | 7.74     | 8.38     | 9.93     | 14.60    |
  throughput          | 574.00   | 844.00   | 970.00   | 1083.00  | 1318.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.01     | 8.87     | 10.23    | 10.96    | 14.60    |
  throughput          | 574.00   | 765.00   | 808.00   | 945.00   | 1195.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 3.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.80     | 10.24    | 11.32    | 11.90    | 16.14    |
  throughput          | 520.00   | 705.00   | 730.00   | 819.00   | 1075.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 4.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.49	10.92	11.98	14.22	18.79
throughput	446.00	589.00	695.00	768.00	987.00
rexmt data pkts	0.00	0.00	1.00	1.00	2.00
duplicate acks	2.00	2.00	4.00	7.00	9.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	0.00	1.00	2.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	5.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.67	13.25	15.51	17.92	25.55
throughput	328.00	468.00	516.00	633.00	967.00
rexmt data pkts	1.00	1.00	2.00	2.00	3.00
duplicate acks	2.00	3.00	6.00	7.00	11.00
triple dupacks	0.00	0.00	1.00	1.00	2.00
pkts dropped (q)	0.00	0.00	1.00	2.00	3.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	5.00	5.00	9.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

B.3.2 IW4 + TS

This sub subsection has the results of Initial Window of four segments with TCP Timestamps option enabled.

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - IW4
Workload: s+2s
==========
Total time of a basic test: min: 3.39, max: 13.00, median: 4.80 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.18	3.40	4.21	5.74	7.10
throughput	886.00	1096.00	1453.00	1849.00	1976.00
rexmt data pkts	0.00	0.00	0.00	1.00	4.00
duplicate acks	1.00	1.00	1.00	2.00	6.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	1.58	1.63	1.63	2.45	4.54
throughput	462.00	855.00	1283.00	1285.00	1323.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	1.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	1.89	1.90	2.42	3.45	10.95
throughput	191.00	608.00	809.00	1105.00	1109.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	1.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - IW4
Workload: s+2m
==========
Total time of a basic test: min: 5.17, max: 12.79, median: 6.87 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.38     | 3.63     | 4.08     | 5.53     | 7.88     |
  throughput          | 798.00   | 1137.00  | 1458.00  | 1732.00  | 1859.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.36     | 4.06     | 4.78     | 5.28     | 7.13     |
  throughput          | 1175.00  | 1588.00  | 1742.00  | 2065.00  | 2499.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.80     | 4.50     | 5.27     | 6.08     | 11.44    |
  throughput          | 733.00   | 1379.00  | 1588.00  | 1863.00  | 2206.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - IW4
Workload: s+8m
====================
Total time of a basic test: min: 13.91, max: 24.02, median: 17.13 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.68     | 4.86     | 5.18     | 7.20     | 13.80    |
```

```
  throughput          | 456.00   | 874.00   | 1200.00  | 1294.00  | 1710.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.25     | 4.08     | 4.53     | 4.81     | 6.23     |
  throughput          | 1345.00  | 1742.00  | 1836.00  | 2053.00  | 2581.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.05     | 4.58     | 4.93     | 5.35     | 6.76     |
  throughput          | 1240.00  | 1568.00  | 1670.00  | 1831.00  | 2071.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.52     | 4.95     | 5.23     | 5.65     | 6.77     |
  throughput          | 1239.00  | 1485.00  | 1589.00  | 1694.00  | 1857.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.95     | 5.37     | 5.68     | 6.08     | 7.23     |
  throughput          | 1160.00  | 1379.00  | 1461.00  | 1562.00  | 1694.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.13     | 5.80     | 6.00     | 6.43     | 7.96     |
  throughput          | 1053.00  | 1303.00  | 1394.00  | 1445.00  | 1636.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.31     | 6.00     | 6.19     | 6.97     | 8.43     |
  throughput          | 994.00   | 1202.00  | 1332.00  | 1398.00  | 1579.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.38     | 6.28     | 6.63     | 7.22     | 15.17    |
  throughput          | 553.00   | 1162.00  | 1258.00  | 1334.00  | 1559.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 2.00     | 7.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.67     | 6.54     | 7.38     | 8.85     | 15.79    |
  throughput          | 531.00   | 947.00   | 1118.00  | 1282.00  | 1479.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 5.00     | 12.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 3.00     | 10.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - IW4
Workload: m+2m
====================
Total time of a basic test: min: 5.99, max: 15.40, median: 7.24 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.10     | 5.76     | 6.09     | 7.20     | 11.89    |
  throughput          | 1058.00  | 1747.00  | 2031.00  | 2185.00  | 2467.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 13.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 11.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.20     | 5.03     | 5.60     | 7.42     |
  throughput          | 1130.00  | 1498.00  | 1644.00  | 1995.00  | 1996.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.64     | 4.92     | 5.70     | 7.22     | 13.35    |
  throughput          | 628.00   | 1160.00  | 1448.00  | 1703.00  | 1808.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - IW4
Workload: m+8m
====================
Total time of a basic test: min: 15.83, max: 28.79, median: 18.86 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.83     | 6.75     | 7.46     | 9.86     | 19.42    |
  throughput          | 648.00   | 1275.00  | 1645.00  | 1863.00  | 2158.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.36     | 4.02     | 4.58     | 5.31     | 5.95     |
  throughput          | 1410.00  | 1580.00  | 1799.00  | 2087.00  | 2495.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.56	4.93	5.28	5.77	6.79
throughput	1235.00	1452.00	1575.00	1700.00	2354.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	1.00	1.00	1.00	8.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	6.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.31	5.37	5.58	6.29	6.93
throughput	1211.00	1333.00	1501.00	1562.00	1946.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	1.00	1.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.52	5.71	6.04	6.78	7.69
throughput	1091.00	1237.00	1386.00	1467.00	1854.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	1.00	1.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.45	6.15	6.37	7.21	9.24
throughput	907.00	1163.00	1289.00	1362.00	1538.00
rexmt data pkts	0.00	0.00	0.00	1.00	1.00
duplicate acks	1.00	1.00	1.00	2.00	9.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.47     | 6.48     | 6.94     | 7.91     | 10.21    |
  throughput          | 821.00   | 1060.00  | 1201.00  | 1293.00  | 1534.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.02     | 6.94     | 7.99     | 9.26     | 10.96    |
  throughput          | 765.00   | 905.00   | 1045.00  | 1207.00  | 1393.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 8.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 6.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.04     | 7.46     | 8.75     | 11.35    | 14.64    |
  throughput          | 573.00   | 739.00   | 924.00   | 1124.00  | 1388.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 2.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 7.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 1.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 5.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

LOSSY LINK WITH MEDIUM ARQ PERSISTENCY - IW4
Workload: l+8m
```

```
====================
Total time of a basic test: min: 24.13, max: 43.61, median: 26.48 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 18.92    | 21.53    | 23.18    | 26.20    | 43.61    |
  throughput          | 1646.00  | 2740.00  | 3072.00  | 3334.00  | 3794.00  |
  rexmt data pkts     | 1.00     | 2.00     | 3.00     | 5.00     | 23.00    |
  duplicate acks      | 20.00    | 26.00    | 29.00    | 34.00    | 43.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  pkts dropped (q)    | 0.00     | 2.00     | 2.00     | 4.00     | 21.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 23.00    | 26.00    | 29.00    | 37.00    | 52.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.51     | 4.49     | 5.67     | 6.70     | 7.89     |
  throughput          | 1063.00  | 1251.00  | 1475.00  | 1869.00  | 2391.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 1.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.75     | 5.35     | 5.98     | 6.95     | 7.90     |
  throughput          | 1061.00  | 1206.00  | 1392.00  | 1566.00  | 1763.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.18     | 5.97     | 6.93     | 7.50     | 9.22     |
  throughput          | 910.00   | 1117.00  | 1206.00  | 1405.00  | 1617.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.13     | 6.88     | 7.39     | 7.97     | 10.93    |
  throughput          | 767.00   | 1052.00  | 1121.00  | 1219.00  | 1367.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 0.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.70     | 7.53     | 8.10     | 9.06     | 11.03    |
  throughput          | 760.00   | 925.00   | 1034.00  | 1113.00  | 1251.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.45     | 8.88     | 9.95     | 11.38    | 16.73    |
  throughput          | 501.00   | 737.00   | 820.00   | 944.00   | 1125.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 3.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.73	10.35	11.60	14.15	20.51
throughput	409.00	592.00	703.00	810.00	1085.00
rexmt data pkts	0.00	0.00	1.00	2.00	3.00
duplicate acks	1.00	2.00	2.00	7.00	13.00
triple dupacks	0.00	0.00	0.00	1.00	3.00
pkts dropped (q)	0.00	0.00	0.00	1.00	2.00
pkts dropped (e)	0.00	0.00	0.00	1.00	3.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	6.00	11.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.79	13.06	15.68	18.03	22.49
throughput	373.00	465.00	526.00	642.00	1077.00
rexmt data pkts	0.00	1.00	1.00	2.00	6.00
duplicate acks	1.00	1.00	2.00	4.00	9.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	1.00	2.00	4.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	4.00	8.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

B.4 Tests with lossy link with high ARQ persistency

In this subsection we present the results of tests with a link capable of three retransmissions.

B.4.1 Baseline TCP - TS

This sub subsection has the results of baseline TCP tests with TCP Timestamps option disabled.

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: s+2s
==========
Total time of a basic test: min: 3.79, max: 11.13, median: 4.81 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.79	3.79	4.63	5.89	11.13
throughput	565.00	1067.00	1334.00	1659.00	1659.00
rexmt data pkts	0.00	0.00	0.00	0.00	5.00
duplicate acks	1.00	2.00	2.00	2.00	6.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	4.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.18	2.32	2.32	3.50	5.64
throughput	372.00	600.00	796.00	905.00	962.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	2.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.31	2.32	2.81	3.72	5.65
throughput	371.00	564.00	730.00	902.00	907.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: s+2m
==========
Total time of a basic test: min: 5.69, max: 11.25, median: 7.09 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 4.64     | 5.29     | 5.96     | 9.35     |
  throughput          | 673.00   | 1054.00  | 1182.00  | 1356.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.16     | 4.16     | 5.08     | 6.38     | 8.03     |
  throughput          | 1044.00  | 1314.00  | 1618.00  | 2015.00  | 2016.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 4.91     | 5.49     | 6.95     | 8.55     |
  throughput          | 981.00   | 1207.00  | 1476.00  | 1707.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: s+8m
====================
Total time of a basic test: min: 15.60, max: 28.50, median: 19.03 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.72     | 5.60     | 6.77     | 9.01     |
```

```
  throughput          | 698.00   | 928.00   | 1050.00  | 1333.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.22     | 4.81     | 5.08     | 5.68     | 6.62     |
  throughput          | 1267.00  | 1477.00  | 1608.00  | 1744.00  | 1985.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.66     | 5.19     | 5.49     | 5.98     | 6.84     |
  throughput          | 1226.00  | 1403.00  | 1525.00  | 1616.00  | 1798.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.76     | 5.52     | 5.93     | 6.22     | 7.23     |
  throughput          | 1159.00  | 1348.00  | 1398.00  | 1519.00  | 1761.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.26     | 5.82     | 6.14     | 6.74     | 7.75     |
  throughput          | 1082.00  | 1245.00  | 1344.00  | 1440.00  | 1595.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.36     | 6.13     | 6.62     | 7.43     | 9.64     |
  throughput          | 870.00   | 1128.00  | 1261.00  | 1368.00  | 1565.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.38     | 6.47     | 7.30     | 8.02     | 9.79     |
  throughput          | 856.00   | 1045.00  | 1144.00  | 1296.00  | 1558.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.63     | 6.76     | 7.42     | 8.77     | 10.79    |
  throughput          | 777.00   | 956.00   | 1127.00  | 1240.00  | 1489.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 5.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.85     | 6.98     | 7.99     | 9.08     | 18.96    |
  throughput          | 442.00   | 923.00   | 1034.00  | 1201.00  | 1434.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 12.72, median: 8.78 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.52     | 6.79     | 7.53     | 8.97     | 12.11    |
  throughput          | 1039.00  | 1402.00  | 1649.00  | 1853.00  | 2280.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.66     | 5.48     | 6.24     | 7.56     | 11.19    |
  throughput          | 749.00   | 1109.00  | 1317.00  | 1529.00  | 1800.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.67     | 6.60     | 7.83     | 11.37    |
  throughput          | 737.00   | 1071.00  | 1262.00  | 1477.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: m+8m
====================
Total time of a basic test: min: 17.55, max: 25.36, median: 20.65 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.14     | 7.18     | 8.11     | 9.54     | 13.05    |
  throughput          | 963.00   | 1318.00  | 1526.00  | 1751.00  | 2047.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.47     | 5.08     | 5.20     | 5.62     | 6.65     |
  throughput          | 1262.00  | 1491.00  | 1579.00  | 1652.00  | 1877.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.17	5.59	5.75	6.16	8.54
throughput	981.00	1361.00	1440.00	1500.00	1622.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.27	5.75	6.18	6.62	8.76
throughput	957.00	1267.00	1342.00	1458.00	1590.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	1.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.42	6.03	6.36	7.28	8.87
throughput	945.00	1151.00	1306.00	1392.00	1547.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	1.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.49	6.39	7.04	8.03	8.96
throughput	936.00	1044.00	1148.00	1312.00	1526.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	1.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.99     | 6.91     | 7.95     | 8.66     | 9.68     |
  throughput          | 866.00   | 968.00   | 1041.00  | 1213.00  | 1401.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.51     | 7.22     | 8.10     | 8.97     | 10.70    |
  throughput          | 784.00   | 935.00   | 1008.00  | 1161.00  | 1287.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.80     | 7.80     | 8.51     | 9.61     | 12.42    |
  throughput          | 675.00   | 872.00   | 982.00   | 1075.00  | 1234.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: l+8m
```

```
====================
Total time of a basic test: min: 23.44, max: 42.19, median: 30.22 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 20.02    | 22.74    | 24.36    | 26.56    | 42.19    |
  throughput          | 1702.00  | 2703.00  | 2932.00  | 3156.00  | 3585.00  |
  rexmt data pkts     | 1.00     | 15.00    | 17.00    | 19.00    | 23.00    |
  duplicate acks      | 2.00     | 29.00    | 32.00    | 35.00    | 49.00    |
  triple dupacks      | 0.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 15.00    | 17.00    | 19.00    | 23.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 42.00    | 47.00    | 49.00    | 50.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.97     | 4.74     | 5.93     | 6.73     | 7.91     |
  throughput          | 1060.00  | 1246.00  | 1382.00  | 1768.00  | 2110.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.25     | 5.81     | 6.58     | 7.42     | 11.12    |
  throughput          | 754.00   | 1130.00  | 1274.00  | 1444.00  | 1974.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.48     | 7.20     | 8.10     | 8.71     | 11.36    |
  throughput          | 738.00   | 962.00   | 1024.00  | 1164.00  | 1293.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.07     | 7.69     | 8.62     | 9.59     | 12.52    |
  throughput          | 670.00   | 874.00   | 957.00   | 1090.00  | 1186.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.11     | 7.89     | 9.43     | 11.91    | 13.05    |
  throughput          | 643.00   | 704.00   | 824.00   | 1062.00  | 1179.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 8.55     | 11.90    | 12.63    | 13.95    | 16.25    |
  throughput          | 516.00   | 601.00   | 653.00   | 705.00   | 981.00   |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 1.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 4.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.67	12.58	13.70	15.62	18.99
throughput	441.00	537.00	606.00	667.00	968.00
rexmt data pkts	0.00	1.00	1.00	2.00	6.00
duplicate acks	1.00	3.00	4.00	7.00	8.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	1.00	1.00	2.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	4.00	6.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	9.27	14.17	15.46	18.20	21.40
throughput	392.00	461.00	540.00	592.00	904.00
rexmt data pkts	0.00	1.00	2.00	2.00	5.00
duplicate acks	1.00	3.00	4.00	7.00	8.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	1.00	1.00	2.00	3.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	5.00	6.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

B.4.2 IW4 - TS

This sub subsection has the results of Initial Window of four segments with TCP Timestamps option disabled.

```
LOSSY LINK WITH HIGH ARQ PERSISTENCY - IW4-TS
Workload: s+2s
====================
Total time of a basic test: min: 3.32, max: 8.21, median: 4.14 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.32     | 3.32     | 4.02     | 4.72     | 8.21     |
  throughput          | 766.00   | 1333.00  | 1565.00  | 1895.00  | 1895.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 1.62     | 1.62     | 1.62     | 2.32     | 4.03     |
  throughput          | 520.00   | 904.00   | 1292.00  | 1295.00  | 1296.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 1.85     | 1.85     | 1.85     | 3.02     | 4.36     |
  throughput          | 481.00   | 695.00   | 1136.00  | 1136.00  | 1136.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - IW4-TS
Workload: s+2m
====================
Total time of a basic test: min: 5.07, max: 11.57, median: 6.50 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.33     | 3.33     | 4.03     | 5.72     | 9.96     |
  throughput          | 632.00   | 1100.00  | 1381.00  | 1889.00  | 1889.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.32     | 3.91     | 4.58     | 5.05     | 6.94     |
  throughput          | 1208.00  | 1662.00  | 1782.00  | 2146.00  | 2529.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.72     | 4.35     | 4.95     | 5.75     | 9.73     |
  throughput          | 862.00   | 1459.00  | 1686.00  | 1925.00  | 2255.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - IW4-TS
Workload: s+8m
====================
Total time of a basic test: min: 14.00, max: 22.02, median: 16.84 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.62     | 3.96     | 4.97     | 7.00     | 10.49    |
```

```
  throughput          | 600.00   | 898.00   | 1216.00  | 1587.00  | 1737.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.99     | 4.23     | 4.60     | 4.94     | 5.90     |
  throughput          | 1420.00  | 1699.00  | 1784.00  | 1982.00  | 2099.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.06     | 4.87     | 5.22     | 5.82     | 6.83     |
  throughput          | 1228.00  | 1440.00  | 1607.00  | 1722.00  | 2067.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.41     | 4.98     | 5.49     | 6.23     | 7.54     |
  throughput          | 1112.00  | 1346.00  | 1494.00  | 1685.00  | 1903.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.82     | 5.46     | 6.00     | 6.86     | 8.30     |
  throughput          | 1010.00  | 1223.00  | 1361.00  | 1535.00  | 1741.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.21     | 5.70     | 6.66     | 7.38     | 9.12     |
  throughput          | 919.00   | 1136.00  | 1245.00  | 1472.00  | 1608.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.61     | 6.00     | 6.84     | 7.79     | 11.51    |
  throughput          | 728.00   | 1076.00  | 1214.00  | 1396.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.92     | 6.30     | 6.95     | 8.64     | 12.58    |
  throughput          | 666.00   | 970.00   | 1165.00  | 1332.00  | 1416.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 7.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.09     | 6.65     | 7.27     | 9.53     | 12.68    |
  throughput          | 661.00   | 880.00   | 1058.00  | 1261.00  | 1377.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 7.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 4.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - IW4-TS
Workload: m+2m
====================
Total time of a basic test: min: 5.86, max: 11.37, median: 7.54 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.03     | 5.73     | 6.43     | 7.35     | 11.06    |
  throughput          | 1137.00  | 1710.00  | 1927.00  | 2193.00  | 2498.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.11     | 4.12     | 5.18     | 6.39     | 9.37     |
  throughput          | 895.00   | 1313.00  | 1524.00  | 2036.00  | 2041.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.51     | 4.80     | 5.98     | 6.99     | 10.03    |
  throughput          | 836.00   | 1199.00  | 1396.00  | 1745.00  | 1857.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - IW4-TS
Workload: m+8m
====================
Total time of a basic test: min: 16.42, max: 25.67, median: 19.55 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.76     | 7.18     | 8.09     | 9.28     | 13.25    |
  throughput          | 949.00   | 1355.00  | 1519.00  | 1751.00  | 2182.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 10.00    |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 3.00     | 11.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.32     | 3.97     | 4.60     | 5.06     | 6.42     |
  throughput          | 1305.00  | 1658.00  | 1777.00  | 2113.00  | 2523.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.01	5.13	5.63	6.26	7.28
throughput	1152.00	1339.00	1481.00	1634.00	2091.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	2.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.87	5.68	6.12	6.63	7.57
throughput	1107.00	1265.00	1353.00	1477.00	1722.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	4.96	6.04	6.55	6.98	8.91
throughput	941.00	1202.00	1267.00	1388.00	1691.00
rexmt data pkts	0.00	0.00	0.00	0.00	6.00
duplicate acks	1.00	2.00	2.00	2.00	7.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.25	6.55	6.95	7.54	9.40
throughput	892.00	1112.00	1198.00	1280.00	1596.00
rexmt data pkts	0.00	0.00	0.00	0.00	6.00
duplicate acks	1.00	2.00	2.00	2.00	7.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.82     | 7.04     | 7.50     | 8.56     | 10.26    |
  throughput          | 817.00   | 979.00   | 1093.00  | 1192.00  | 1441.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.88     | 7.15     | 7.82     | 9.60     | 11.27    |
  throughput          | 744.00   | 873.00   | 1064.00  | 1172.00  | 1426.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 5.00     | 7.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 6.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.90     | 7.90     | 9.13     | 10.14    | 15.23    |
  throughput          | 550.00   | 827.00   | 912.00   | 1061.00  | 1422.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 5.00     | 8.00     |
  duplicate acks      | 1.00     | 2.00     | 4.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - IW4-TS
Workload: l+8m
```

```
====================
Total time of a basic test: min: 22.51, max: 35.44, median: 26.90 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 18.13    | 23.19    | 24.69    | 28.44    | 35.44    |
  throughput          | 2026.00  | 2524.00  | 2771.00  | 3096.00  | 3960.00  |
  rexmt data pkts     | 1.00     | 2.00     | 4.00     | 9.00     | 20.00    |
  duplicate acks      | 7.00     | 26.00    | 30.00    | 32.00    | 35.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 1.00     | 2.00     | 7.00     | 20.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 28.00    | 31.00    | 35.00    | 50.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.46     | 4.84     | 5.85     | 6.61     | 7.97     |
  throughput          | 1052.00  | 1269.00  | 1418.00  | 1732.00  | 2423.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.67     | 5.73     | 6.33     | 7.16     | 10.19    |
  throughput          | 822.00   | 1170.00  | 1294.00  | 1463.00  | 2283.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.04     | 6.84     | 7.09     | 7.79     | 10.54    |
  throughput          | 795.00   | 1076.00  | 1154.00  | 1226.00  | 1663.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 4.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.19     | 7.26     | 7.78     | 9.32     | 11.47    |
  throughput          | 731.00   | 899.00   | 1068.00  | 1154.00  | 1354.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.44     | 7.94     | 9.05     | 10.15    | 12.25    |
  throughput          | 685.00   | 826.00   | 898.00   | 1055.00  | 1302.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.89     | 8.79     | 9.94     | 11.59    | 15.05    |
  throughput          | 557.00   | 723.00   | 815.00   | 953.00   | 1062.00  |
  rexmt data pkts     | 0.00     | 0.00     | 2.00     | 5.00     | 8.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 6.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.91	9.44	11.51	13.26	16.83
throughput	498.00	632.00	726.00	888.00	1060.00
rexmt data pkts	0.00	0.00	1.00	5.00	7.00
duplicate acks	1.00	2.00	3.00	6.00	11.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	0.00	1.00	5.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	8.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.18	9.75	13.03	17.48	25.13
throughput	334.00	480.00	641.00	860.00	1025.00
rexmt data pkts	0.00	0.00	1.00	5.00	8.00
duplicate acks	1.00	2.00	3.00	5.00	11.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	3.00	5.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	3.00

B.4.3 D-SACK

This sub subsection has the results of D-SACK tests.

LOSSY LINK WITH HIGH ARQ PERSISTENCY - D-SACK
Workload: s+2s
==========
Total time of a basic test: min: 3.78, max: 7.50, median: 5.19 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.78	4.49	5.06	5.84	7.50
throughput	838.00	1076.00	1211.00	1400.00	1661.00
rexmt data pkts	0.00	0.00	0.00	0.00	4.00
duplicate acks	1.00	2.00	2.00	2.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	3.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.17	2.32	2.47	3.52	4.58
throughput	457.00	595.00	848.00	905.00	967.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.31	2.32	2.62	3.72	4.83
throughput	434.00	564.00	695.00	903.00	907.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

LOSSY LINK WITH HIGH ARQ PERSISTENCY - D-SACK
Workload: s+2m
==========
Total time of a basic test: min: 5.69, max: 10.52, median: 7.77 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 4.64     | 5.21     | 6.04     | 8.60     |
  throughput          | 731.00   | 1041.00  | 1189.00  | 1356.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.00     | 4.86     | 5.44     | 5.98     | 8.41     |
  throughput          | 997.00   | 1402.00  | 1528.00  | 1725.00  | 2094.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 5.05     | 5.56     | 6.40     | 9.17     |
  throughput          | 914.00   | 1310.00  | 1478.00  | 1661.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - D-SACK
Workload: s+8m
====================
Total time of a basic test: min: 15.43, max: 23.33, median: 19.07 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.72     | 5.59     | 6.43     | 8.41     |
```

```
  throughput          | 748.00   | 978.00   | 1122.00  | 1333.00  | 1498.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.41     | 4.77     | 5.27     | 5.70     | 7.25     |
  throughput          | 1157.00  | 1472.00  | 1581.00  | 1758.00  | 1901.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.57     | 5.38     | 5.63     | 6.31     | 8.22     |
  throughput          | 1020.00  | 1328.00  | 1479.00  | 1558.00  | 1834.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.75     | 5.69     | 5.98     | 6.69     | 8.59     |
  throughput          | 976.00   | 1253.00  | 1373.00  | 1474.00  | 1763.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.18     | 5.96     | 6.44     | 6.86     | 8.74     |
  throughput          | 959.00   | 1222.00  | 1290.00  | 1406.00  | 1620.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.62     | 6.46     | 6.70     | 7.55     | 8.92     |
  throughput          | 940.00   | 1110.00  | 1235.00  | 1299.00  | 1491.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.64     | 6.57     | 7.14     | 8.07     | 10.01    |
  throughput          | 838.00   | 1039.00  | 1161.00  | 1275.00  | 1488.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.25     | 6.92     | 7.55     | 8.53     | 12.86    |
  throughput          | 652.00   | 983.00   | 1105.00  | 1212.00  | 1341.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.61     | 7.43     | 8.27     | 9.28     | 16.03    |
  throughput          | 523.00   | 903.00   | 1013.00  | 1129.00  | 1268.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 4.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 2.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - D-SACK
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 10.87, median: 7.95 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 6.22     | 7.04     | 8.30     | 10.37    |
  throughput          | 1213.00  | 1515.00  | 1777.00  | 2023.00  | 2280.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 5.46     | 5.90     | 6.72     | 9.03     |
  throughput          | 928.00   | 1248.00  | 1392.00  | 1535.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.55     | 6.21     | 7.27     | 9.26     |
  throughput          | 906.00   | 1153.00  | 1330.00  | 1511.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - D-SACK
Workload: m+8m
====================
Total time of a basic test: min: 18.11, max: 26.70, median: 21.01 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.15     | 7.30     | 7.97     | 11.04    | 14.08    |
  throughput          | 893.00   | 1139.00  | 1570.00  | 1723.00  | 2046.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.95     | 5.00     | 5.47     | 6.10     | 6.84     |
  throughput          | 1225.00  | 1374.00  | 1517.00  | 1677.00  | 2121.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.20	5.76	6.04	6.78	8.36
throughput	1003.00	1236.00	1358.00	1456.00	1613.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.38	5.93	6.23	7.18	8.39
throughput	1000.00	1167.00	1342.00	1414.00	1558.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.44	6.32	6.64	7.48	10.13
throughput	828.00	1120.00	1237.00	1326.00	1542.00
rexmt data pkts	0.00	0.00	0.00	0.00	3.00
duplicate acks	1.00	1.00	1.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	2.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.69	6.67	7.35	8.04	10.27
throughput	816.00	1043.00	1126.00	1257.00	1472.00
rexmt data pkts	0.00	0.00	0.00	0.00	2.00
duplicate acks	1.00	1.00	1.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.24     | 7.41     | 7.78     | 8.36     | 11.54    |
  throughput          | 727.00   | 1003.00  | 1064.00  | 1131.00  | 1344.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.74     | 7.80     | 8.45     | 9.02     | 11.78    |
  throughput          | 712.00   | 930.00   | 981.00   | 1075.00  | 1244.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.74     | 8.44     | 9.04     | 10.09    | 12.19    |
  throughput          | 688.00   | 831.00   | 922.00   | 994.00   | 1244.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 2.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - D-SACK
Workload: l+8m
```

```
====================
Total time of a basic test: min: 24.39, max: 38.33, median: 28.94 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 21.56    | 22.82    | 24.75    | 30.27    | 38.33    |
  throughput          | 1873.00  | 2372.00  | 2793.00  | 3146.00  | 3329.00  |
  rexmt data pkts     | 1.00     | 5.00     | 16.00    | 19.00    | 20.00    |
  duplicate acks      | 1.00     | 25.00    | 31.00    | 33.00    | 36.00    |
  triple dupacks      | 0.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 1.00     | 16.00    | 19.00    | 20.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 30.00    | 42.00    | 48.00    | 51.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.07     | 5.48     | 5.84     | 6.83     | 8.02     |
  throughput          | 1045.00  | 1227.00  | 1394.00  | 1530.00  | 2059.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.19     | 5.56     | 6.28     | 7.24     | 10.90    |
  throughput          | 769.00   | 1158.00  | 1282.00  | 1508.00  | 1999.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.07     | 6.82     | 7.55     | 8.52     | 12.42    |
  throughput          | 675.00   | 984.00   | 1090.00  | 1229.00  | 1382.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.68     | 7.08     | 8.04     | 9.46     | 12.77    |
  throughput          | 657.00   | 887.00   | 1041.00  | 1185.00  | 1256.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.08     | 7.71     | 8.94     | 10.78    | 13.66    |
  throughput          | 614.00   | 778.00   | 928.00   | 1088.00  | 1184.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.41     | 10.26    | 11.71    | 13.35    | 15.72    |
  throughput          | 533.00   | 628.00   | 711.00   | 817.00   | 1132.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 1.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 4.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 1.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	7.60	10.64	12.66	13.67	16.63
throughput	504.00	613.00	646.00	788.00	1104.00
rexmt data pkts	0.00	0.00	1.00	2.00	6.00
duplicate acks	1.00	2.00	3.00	7.00	10.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	0.00	1.00	2.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	1.00	5.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.25	13.27	15.39	16.91	19.67
throughput	426.00	496.00	544.00	632.00	1017.00
rexmt data pkts	0.00	1.00	2.00	2.00	5.00
duplicate acks	1.00	3.00	5.00	6.00	9.00
triple dupacks	0.00	0.00	1.00	1.00	1.00
pkts dropped (q)	0.00	0.00	1.00	2.00	2.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	1.00	4.00	5.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

B.4.4 F-RTO

This sub subsection has the results of F-RTO tests.

LOSSY LINK WITH HIGH ARQ PERSISTENCY - F-RTO
Workload: s+2s
==========
Total time of a basic test: min: 3.79, max: 7.85, median: 5.19 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.79	4.44	5.14	5.95	7.85
throughput	801.00	1057.00	1212.00	1415.00	1661.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.17	2.32	3.02	3.89	5.28
throughput	397.00	539.00	695.00	905.00	967.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.31	2.32	3.18	4.17	5.61
throughput	374.00	503.00	589.00	903.00	907.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	2.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

LOSSY LINK WITH HIGH ARQ PERSISTENCY - F-RTO
Workload: s+2m
==========
Total time of a basic test: min: 5.69, max: 11.10, median: 7.31 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 4.59     | 4.99     | 5.34     | 10.37    |
  throughput          | 606.00   | 1178.00  | 1257.00  | 1371.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.01     | 4.72     | 5.33     | 5.69     | 7.86     |
  throughput          | 1067.00  | 1475.00  | 1569.00  | 1775.00  | 2090.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.31     | 4.91     | 5.49     | 6.09     | 8.52     |
  throughput          | 984.00   | 1376.00  | 1500.00  | 1707.00  | 1946.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - F-RTO
Workload: s+8m
====================
Total time of a basic test: min: 15.50, max: 25.63, median: 19.34 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.87     | 5.57     | 7.39     | 9.60     |
```

```
  throughput          | 655.00   | 851.00   | 1121.00  | 1292.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.39     | 4.85     | 5.24     | 5.67     | 7.35     |
  throughput          | 1141.00  | 1478.00  | 1593.00  | 1729.00  | 1910.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.49     | 5.18     | 5.72     | 6.01     | 7.43     |
  throughput          | 1128.00  | 1395.00  | 1465.00  | 1618.00  | 1868.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.77     | 5.42     | 5.79     | 6.28     | 7.55     |
  throughput          | 1111.00  | 1335.00  | 1447.00  | 1546.00  | 1759.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.21     | 5.87     | 6.37     | 6.91     | 7.72     |
  throughput          | 1086.00  | 1214.00  | 1296.00  | 1429.00  | 1610.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.61     | 6.35     | 6.86     | 7.87     | 8.83     |
  throughput          | 949.00   | 1066.00  | 1164.00  | 1321.00  | 1494.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.84     | 6.70     | 7.65     | 8.26     | 9.13     |
  throughput          | 918.00   | 1015.00  | 1068.00  | 1252.00  | 1435.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.98     | 7.04     | 8.07     | 8.97     | 11.38    |
  throughput          | 737.00   | 935.00   | 1027.00  | 1191.00  | 1401.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 5.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.21     | 7.66     | 8.82     | 9.75     | 16.18    |
  throughput          | 518.00   | 860.00   | 938.00   | 1095.00  | 1351.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - F-RTO
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 16.59, median: 8.50 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 6.41     | 7.61     | 9.60     | 15.77    |
  throughput          | 798.00   | 1309.00  | 1621.00  | 1961.00  | 2283.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 5.48     | 5.93     | 7.77     | 10.90    |
  throughput          | 769.00   | 1079.00  | 1371.00  | 1529.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.92     | 6.32     | 8.49     | 13.85    |
  throughput          | 605.00   | 988.00   | 1314.00  | 1417.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - F-RTO
Workload: m+8m
====================
Total time of a basic test: min: 17.75, max: 25.25, median: 20.69 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.14     | 7.09     | 8.67     | 9.95     | 11.98    |
  throughput          | 1050.00  | 1264.00  | 1436.00  | 1774.00  | 2050.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.98     | 5.05     | 5.26     | 5.87     | 6.81     |
  throughput          | 1230.00  | 1427.00  | 1564.00  | 1660.00  | 2105.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.05	5.60	6.04	6.60	7.59
throughput	1104.00	1270.00	1369.00	1497.00	1661.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	2.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.28	5.84	6.33	7.17	8.35
throughput	1003.00	1170.00	1320.00	1436.00	1589.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.38	6.04	6.62	7.43	8.79
throughput	954.00	1128.00	1257.00	1387.00	1558.00
rexmt data pkts	0.00	0.00	0.00	0.00	4.00
duplicate acks	1.00	1.00	2.00	2.00	6.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.43	6.40	7.19	8.55	9.59
throughput	874.00	981.00	1166.00	1310.00	1545.00
rexmt data pkts	0.00	0.00	0.00	0.00	5.00
duplicate acks	1.00	1.00	2.00	2.00	7.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.24     | 7.08     | 7.98     | 8.84     | 9.86     |
  throughput          | 850.00   | 949.00   | 1034.00  | 1184.00  | 1343.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.30     | 7.41     | 8.26     | 9.24     | 13.86    |
  throughput          | 605.00   | 907.00   | 1013.00  | 1132.00  | 1332.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.49     | 7.78     | 8.77     | 10.09    | 15.54    |
  throughput          | 539.00   | 831.00   | 948.00   | 1078.00  | 1293.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - F-RTO
Workload: l+8m
```

```
====================
Total time of a basic test: min: 25.17, max: 39.28, median: 30.48 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 19.47    | 23.38    | 27.66    | 31.15    | 39.28    |
  throughput          | 1827.00  | 2304.00  | 2576.00  | 3070.00  | 3687.00  |
  rexmt data pkts     | 1.00     | 2.00     | 15.00    | 19.00    | 22.00    |
  duplicate acks      | 1.00     | 24.00    | 30.00    | 34.00    | 52.00    |
  triple dupacks      | 0.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 1.00     | 15.00    | 19.00    | 22.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 31.00    | 44.00    | 49.00    | 50.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.99     | 4.87     | 5.61     | 6.54     | 7.51     |
  throughput          | 1116.00  | 1282.00  | 1445.00  | 1722.00  | 2102.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.38     | 5.41     | 6.23     | 7.30     | 8.62     |
  throughput          | 972.00   | 1149.00  | 1305.00  | 1550.00  | 1914.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.66     | 6.59     | 7.41     | 7.94     | 11.56    |
  throughput          | 725.00   | 1055.00  | 1120.00  | 1272.00  | 1481.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.28     | 7.34     | 7.79     | 8.98     | 12.07    |
  throughput          | 695.00   | 933.00   | 1034.00  | 1142.00  | 1334.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 8.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.70     | 7.96     | 8.76     | 11.14    | 13.45    |
  throughput          | 624.00   | 753.00   | 911.00   | 1053.00  | 1250.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.82     | 10.27    | 11.52    | 13.52    | 15.48    |
  throughput          | 542.00   | 620.00   | 717.00   | 817.00   | 1072.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 1.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 3.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.15	11.79	13.44	15.75	20.42
throughput	411.00	532.00	624.00	711.00	1028.00
rexmt data pkts	0.00	0.00	1.00	2.00	4.00
duplicate acks	1.00	2.00	3.00	7.00	9.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	1.00	1.00	3.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.28	13.14	16.30	19.19	23.23
throughput	361.00	437.00	503.00	638.00	1013.00
rexmt data pkts	0.00	1.00	2.00	3.00	5.00
duplicate acks	1.00	2.00	4.00	6.00	9.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	1.00	3.00	4.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	2.00	5.00	7.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

B.4.5 Baseline TCP + TS

This sub subsection has the results of baseline TCP tests with TCP Timestamps option enabled.

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL+TS
Workload: s+2s
==========
Total time of a basic test: min: 3.85, max: 8.80, median: 5.38 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	3.85	4.53	5.35	6.27	8.36
throughput	752.00	1003.00	1171.00	1389.00	1635.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	3.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 1, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 2, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.19	2.32	2.89	4.39	6.80
throughput	308.00	477.00	694.00	902.00	959.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	3.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 2, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	2.33	2.33	3.16	4.82	7.44
throughput	282.00	435.00	572.00	899.00	900.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	3.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL+TS
Workload: s+2m
==========
Total time of a basic test: min: 5.77, max: 11.18, median: 7.91 seconds.

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.98     | 3.98     | 5.38     | 6.63     | 9.94     |
  throughput          | 633.00   | 949.00   | 1123.00  | 1578.00  | 1578.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.32     | 4.74     | 5.80     | 6.42     | 7.83     |
  throughput          | 1071.00  | 1305.00  | 1392.00  | 1768.00  | 1940.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.42     | 5.64     | 6.35     | 7.18     | 9.07     |
  throughput          | 925.00   | 1167.00  | 1319.00  | 1486.00  | 1897.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL+TS
Workload: s+8m
====================
Total time of a basic test: min: 15.74, max: 23.43, median: 19.34 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.24     | 4.95     | 5.61     | 7.12     | 11.79    |
```

```
  throughput          | 533.00   | 883.00   | 1112.00  | 1269.00  | 1482.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.57     | 4.76     | 5.16     | 5.82     | 7.68     |
  throughput          | 1091.00  | 1440.00  | 1611.00  | 1763.00  | 1833.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.86     | 4.98     | 5.51     | 6.25     | 8.73     |
  throughput          | 960.00   | 1341.00  | 1520.00  | 1683.00  | 1726.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.11     | 5.43     | 5.80     | 6.66     | 9.12     |
  throughput          | 919.00   | 1260.00  | 1417.00  | 1545.00  | 1641.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.26     | 6.16     | 6.66     | 7.08     | 9.73     |
  throughput          | 861.00   | 1184.00  | 1250.00  | 1361.00  | 1595.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.27     | 6.94     | 7.59     | 8.12     | 12.04    |
  throughput          | 696.00   | 1033.00  | 1104.00  | 1208.00  | 1591.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 7.18     | 7.66     | 8.85     | 12.22    |
  throughput          | 686.00   | 948.00   | 1075.00  | 1168.00  | 1509.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.79     | 7.64     | 8.16     | 9.05     | 14.15    |
  throughput          | 593.00   | 926.00   | 1017.00  | 1098.00  | 1449.00  |
  rexmt data pkts     | 0.00     | 0.00     | 1.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 3.00     | 4.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.85     | 7.89     | 8.43     | 10.28    | 14.82    |
  throughput          | 566.00   | 816.00   | 965.00   | 1063.00  | 1434.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 3.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL+TS
Workload: m+2m
====================
Total time of a basic test: min: 6.44, max: 15.95, median: 8.51 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 6.78     | 7.44     | 8.18     | 12.19    |
  throughput          | 1032.00  | 1537.00  | 1686.00  | 1854.00  | 2262.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.68     | 5.80     | 6.31     | 7.37     | 10.91    |
  throughput          | 768.00   | 1137.00  | 1325.00  | 1446.00  | 1793.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.07     | 5.92     | 6.65     | 7.88     | 14.60    |
  throughput          | 574.00   | 1064.00  | 1237.00  | 1415.00  | 1653.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 3.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL+TS
Workload: m+8m
====================
Total time of a basic test: min: 17.72, max: 25.27, median: 21.32 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.19     | 7.19     | 8.26     | 8.96     | 11.75    |
  throughput          | 1070.00  | 1403.00  | 1519.00  | 1749.00  | 2031.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.01     | 4.82     | 5.28     | 5.64     | 6.35     |
  throughput          | 1321.00  | 1486.00  | 1587.00  | 1739.00  | 2092.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.27	6.05	6.45	6.80	8.73
throughput	960.00	1233.00	1290.00	1385.00	1590.00
rexmt data pkts	0.00	0.00	0.00	1.00	1.00
duplicate acks	2.00	2.00	2.00	3.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.52	6.20	6.71	7.13	8.82
throughput	951.00	1175.00	1250.00	1351.00	1517.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	3.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.64	6.43	7.13	7.57	8.96
throughput	935.00	1107.00	1175.00	1305.00	1487.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	2.00	2.00	2.00	3.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.71	7.02	7.65	8.11	9.73
throughput	862.00	1034.00	1096.00	1195.00	1470.00
rexmt data pkts	0.00	0.00	0.00	1.00	2.00
duplicate acks	2.00	2.00	2.00	3.00	4.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.71     | 7.51     | 7.97     | 8.75     | 10.51    |
  throughput          | 798.00   | 959.00   | 1047.00  | 1116.00  | 1468.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.06     | 7.57     | 8.19     | 9.31     | 10.95    |
  throughput          | 766.00   | 900.00   | 1006.00  | 1107.00  | 1383.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.14     | 7.78     | 8.63     | 9.76     | 16.21    |
  throughput          | 517.00   | 859.00   | 955.00   | 1078.00  | 1366.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL+TS
Workload: l+8m
```

```
====================
Total time of a basic test: min: 26.98, max: 41.70, median: 30.39 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 20.66    | 23.15    | 25.40    | 27.88    | 39.92    |
  throughput          | 1798.00  | 2575.00  | 2715.00  | 3101.00  | 3475.00  |
  rexmt data pkts     | 1.00     | 5.00     | 16.00    | 18.00    | 22.00    |
  duplicate acks      | 8.00     | 30.00    | 32.00    | 39.00    | 57.00    |
  triple dupacks      | 1.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 4.00     | 16.00    | 18.00    | 21.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 5.00     | 39.00    | 47.00    | 50.00    | 55.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.15     | 4.80     | 5.79     | 6.61     | 7.97     |
  throughput          | 1052.00  | 1268.00  | 1376.00  | 1746.00  | 2021.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.84     | 6.01     | 6.57     | 7.26     | 9.22     |
  throughput          | 910.00   | 1155.00  | 1252.00  | 1396.00  | 1731.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.13     | 7.16     | 7.72     | 9.22     | 13.40    |
  throughput          | 626.00   | 909.00   | 1080.00  | 1170.00  | 1635.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 7.00     |
```

```
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.86     | 7.63     | 9.04     | 9.89     | 15.11    |
  throughput          | 555.00   | 848.00   | 921.00   | 1099.00  | 1431.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 4.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 3.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.07     | 9.09     | 10.09    | 10.82    | 15.42    |
  throughput          | 544.00   | 775.00   | 821.00   | 923.00   | 1186.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 3.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 8.55     | 11.07    | 11.80    | 13.36    | 16.16    |
  throughput          | 519.00   | 627.00   | 710.00   | 757.00   | 980.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  duplicate acks      | 2.00     | 2.00     | 3.00     | 4.00     | 8.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	9.07	12.17	13.46	16.47	21.35
throughput	393.00	509.00	621.00	689.00	924.00
rexmt data pkts	0.00	0.00	1.00	2.00	4.00
duplicate acks	2.00	3.00	4.00	7.00	8.00
triple dupacks	0.00	0.00	0.00	1.00	1.00
pkts dropped (q)	0.00	0.00	0.00	1.00	3.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	1.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	2.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	9.27	13.68	15.47	21.20	25.81
throughput	325.00	395.00	541.00	613.00	905.00
rexmt data pkts	0.00	1.00	1.00	3.00	4.00
duplicate acks	2.00	3.00	5.00	7.00	9.00
triple dupacks	0.00	0.00	1.00	1.00	1.00
pkts dropped (q)	0.00	0.00	1.00	2.00	3.00
pkts dropped (e)	0.00	0.00	0.00	0.00	4.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	4.00	5.00	8.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

B.5 Additional testing

In this subsection we present the results of additional tests.

B.5.1 Tests with lossy link with high ARQ persistency: BL - TS

```
LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: s+2s
====================
Total time of a basic test: min: 3.79, max: 11.04, median: 5.19 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.79     | 3.79     | 5.14     | 6.04     | 11.04    |
  throughput          | 569.00   | 1042.00  | 1212.00  | 1659.00  | 1661.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.18     | 2.32     | 2.47     | 3.57     | 6.56     |
  throughput          | 319.00   | 587.00   | 848.00   | 905.00   | 962.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 2.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 2.31     | 2.32     | 2.61     | 3.72     | 6.98     |
  throughput          | 300.00   | 564.00   | 803.00   | 902.00   | 907.00   |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: s+2m
====================
Total time of a basic test: min: 5.69, max: 17.44, median: 7.09 seconds.
```

```
TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.94     | 4.56     | 5.29     | 6.04     | 17.44    |
  throughput          | 361.00   | 1042.00  | 1187.00  | 1378.00  | 1597.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.15     | 4.73     | 5.49     | 6.58     | 12.41    |
  throughput          | 676.00   | 1275.00  | 1522.00  | 1773.00  | 2018.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.35     | 5.05     | 5.68     | 6.99     | 13.09    |
  throughput          | 640.00   | 1200.00  | 1472.00  | 1662.00  | 1929.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: s+8m
====================
Total time of a basic test: min: 16.25, max: 28.89, median: 19.96 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.20     | 4.60     | 6.02     | 7.63     | 11.13    |
```

```
  throughput          | 565.00   | 824.00   | 1039.00  | 1366.00  | 1496.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 7.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.32     | 4.76     | 5.06     | 5.61     | 7.16     |
  throughput          | 1171.00  | 1496.00  | 1636.00  | 1761.00  | 1941.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.37     | 5.27     | 5.50     | 6.14     | 7.89     |
  throughput          | 1063.00  | 1364.00  | 1517.00  | 1590.00  | 1918.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.95     | 5.68     | 5.90     | 6.54     | 9.07     |
  throughput          | 924.00   | 1281.00  | 1387.00  | 1476.00  | 1695.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

```
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.14     | 5.97     | 6.27     | 7.04     | 10.35    |
  throughput          | 810.00   | 1191.00  | 1332.00  | 1404.00  | 1631.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.24     | 6.17     | 6.67     | 7.53     | 13.48    |
  throughput          | 622.00   | 1113.00  | 1224.00  | 1358.00  | 1599.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 6.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.40     | 6.42     | 7.36     | 8.63     | 13.49    |
  throughput          | 622.00   | 971.00   | 1131.00  | 1306.00  | 1552.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.56     | 6.79     | 7.64     | 9.37     | 13.95    |
  throughput          | 601.00   | 894.00   | 1079.00  | 1235.00  | 1509.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 9.00     |
```

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  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.57     | 7.45     | 8.50     | 11.61    | 22.81    |
  throughput          | 367.00   | 722.00   | 961.00   | 1126.00  | 1277.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: m+2m
====================
Total time of a basic test: min: 6.32, max: 13.66, median: 8.17 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.51     | 6.29     | 6.91     | 8.60     | 12.89    |
  throughput          | 976.00   | 1462.00  | 1820.00  | 2000.00  | 2281.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.78     | 5.63     | 5.85     | 7.33     | 10.17    |
  throughput          | 825.00   | 1144.00  | 1425.00  | 1489.00  | 1753.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
```

```
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.97     | 5.88     | 6.17     | 7.78     | 10.61    |
  throughput          | 790.00   | 1077.00  | 1350.00  | 1426.00  | 1685.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: m+8m
====================
Total time of a basic test: min: 16.59, max: 25.87, median: 21.30 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.83     | 7.46     | 8.82     | 11.66    | 17.27    |
  throughput          | 728.00   | 1079.00  | 1311.00  | 1685.00  | 2158.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 8.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 3.00     | 10.00    |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 9.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 3.96     | 4.86     | 5.11     | 5.84     | 7.40     |
  throughput          | 1132.00  | 1435.00  | 1626.00  | 1727.00  | 2120.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
```

TCP DL CONNECTION SET 3, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.20	5.57	5.99	6.92	8.84
throughput	949.00	1212.00	1383.00	1506.00	1613.00
rexmt data pkts	0.00	0.00	0.00	0.00	1.00
duplicate acks	1.00	1.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 3, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.44	5.89	6.30	7.59	8.97
throughput	934.00	1104.00	1325.00	1424.00	1541.00
rexmt data pkts	0.00	0.00	0.00	0.00	0.00
duplicate acks	1.00	1.00	1.00	2.00	2.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 4, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.47	6.18	6.64	7.90	9.08
throughput	923.00	1061.00	1257.00	1356.00	1532.00
rexmt data pkts	0.00	0.00	0.00	0.00	5.00
duplicate acks	1.00	1.00	2.00	2.00	5.00
triple dupacks	0.00	0.00	0.00	0.00	1.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 5, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 6, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	5.67	6.37	7.56	8.17	9.19
throughput	913.00	1027.00	1098.00	1315.00	1477.00
rexmt data pkts	0.00	0.00	0.00	0.00	3.00
duplicate acks	1.00	1.00	2.00	2.00	3.00
triple dupacks	0.00	0.00	0.00	0.00	0.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00

```
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 5.94     | 6.73     | 8.46     | 8.98     | 10.42    |
  throughput          | 804.00   | 933.00   | 985.00   | 1246.00  | 1410.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 5.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 8, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.07     | 7.17     | 8.88     | 9.70     | 11.32    |
  throughput          | 740.00   | 864.00   | 940.00   | 1169.00  | 1381.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 8, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 9, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.34     | 8.65     | 9.60     | 10.88    | 13.81    |
  throughput          | 607.00   | 771.00   | 859.00   | 970.00   | 1322.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 6.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 9, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

LOSSY LINK WITH HIGH ARQ PERSISTENCY - BL-TS
Workload: l+8m
```

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====================
Total time of a basic test: min: 25.54, max: 40.24, median: 29.83 seconds.

TCP DL CONNECTION SET 1, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 19.94    | 22.73    | 25.05    | 30.24    | 40.24    |
  throughput          | 1784.00  | 2374.00  | 2798.00  | 3158.00  | 3600.00  |
  rexmt data pkts     | 0.00     | 5.00     | 13.00    | 18.00    | 22.00    |
  duplicate acks      | 2.00     | 21.00    | 29.00    | 35.00    | 43.00    |
  triple dupacks      | 0.00     | 1.00     | 1.00     | 1.00     | 2.00     |
  pkts dropped (q)    | 0.00     | 2.00     | 13.00    | 18.00    | 22.00    |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
TCP DL CONNECTION SET 1, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 26.00    | 42.00    | 47.00    | 53.00    |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |

TCP DL CONNECTION SET 2, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.00     | 4.38     | 5.09     | 6.66     | 9.12     |
  throughput          | 919.00   | 1258.00  | 1531.00  | 1912.00  | 2095.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 2.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 2, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 3, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.15     | 5.52     | 6.42     | 6.87     | 9.40     |
  throughput          | 892.00   | 1221.00  | 1291.00  | 1519.00  | 2019.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 3.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 3, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 4, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 4.79     | 6.55     | 7.39     | 8.18     | 12.78    |
  throughput          | 656.00   | 1025.00  | 1110.00  | 1280.00  | 1752.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 7.00     |
  duplicate acks      | 1.00     | 1.00     | 1.00     | 2.00     | 8.00     |
```

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  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 4, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 5, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.28     | 7.41     | 8.41     | 10.79    | 12.78    |
  throughput          | 656.00   | 777.00   | 985.00   | 1131.00  | 1335.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 4.00     |
  duplicate acks      | 1.00     | 1.00     | 2.00     | 2.00     | 4.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 5, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 6, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 6.86     | 8.58     | 9.37     | 11.12    | 13.82    |
  throughput          | 607.00   | 754.00   | 860.00   | 978.00   | 1222.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 0.00     | 3.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 2.00     | 6.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 6, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

TCP DL CONNECTION SET 7, SERVER -> CLIENT
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  elapsed time        | 7.27     | 9.75     | 11.73    | 13.41    | 18.01    |
  throughput          | 465.00   | 625.00   | 704.00   | 860.00   | 1154.00  |
  rexmt data pkts     | 0.00     | 0.00     | 0.00     | 1.00     | 5.00     |
  duplicate acks      | 1.00     | 2.00     | 2.00     | 3.00     | 9.00     |
  triple dupacks      | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 1.00     | 2.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
TCP DL CONNECTION SET 7, CLIENT -> SERVER
  Name                |  min     | 25%      | 50%      | 75%      | max      |
  sacks sent          | 0.00     | 0.00     | 0.00     | 0.00     | 5.00     |
  pkts dropped (q)    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
  pkts dropped (e)    | 0.00     | 0.00     | 0.00     | 0.00     | 1.00     |
```

TCP DL CONNECTION SET 8, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.27	11.11	12.91	14.92	18.85
throughput	445.00	562.00	643.00	755.00	1014.00
rexmt data pkts	0.00	1.00	1.00	3.00	5.00
duplicate acks	1.00	2.00	3.00	7.00	9.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	0.00	1.00	3.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00

TCP DL CONNECTION SET 8, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	0.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, SERVER -> CLIENT

Name	min	25%	50%	75%	max
elapsed time	8.70	12.16	15.86	18.10	22.02
throughput	381.00	463.00	526.00	689.00	964.00
rexmt data pkts	0.00	1.00	2.00	3.00	9.00
duplicate acks	1.00	2.00	3.00	7.00	8.00
triple dupacks	0.00	0.00	0.00	1.00	2.00
pkts dropped (q)	0.00	0.00	1.00	2.00	4.00
pkts dropped (e)	0.00	0.00	0.00	0.00	1.00

TCP DL CONNECTION SET 9, CLIENT -> SERVER

Name	min	25%	50%	75%	max
sacks sent	0.00	0.00	0.00	5.00	5.00
pkts dropped (q)	0.00	0.00	0.00	0.00	0.00
pkts dropped (e)	0.00	0.00	0.00	0.00	0.00