

Appendix

Sender Analysis

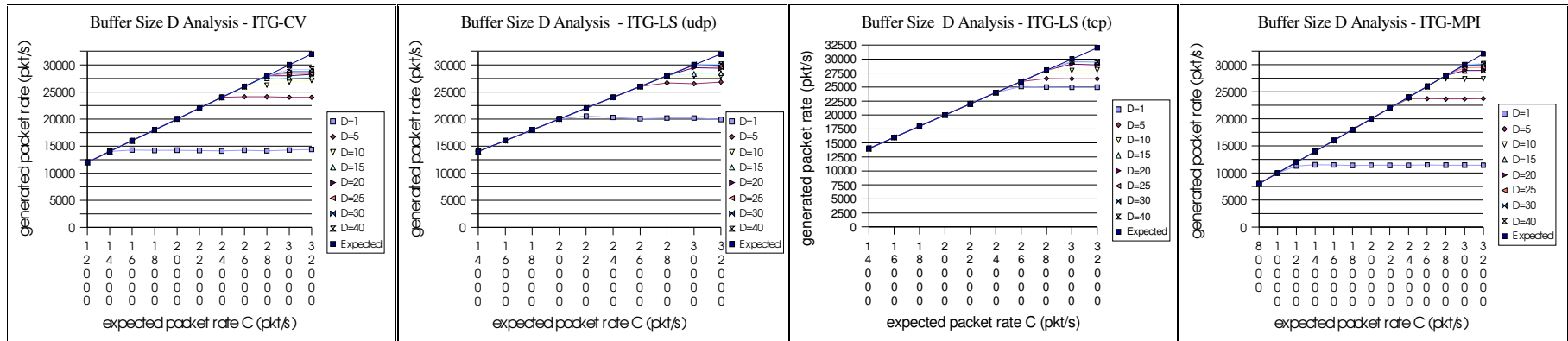


Figure 6. Sender Buffer Size Analysis - Data Rate ($c=512$; $t=60s$): this figure depicts the packet rate achieved by the different implementations of ITGSend as a function of the required packet rate C , for different values of the log buffer size D . The achieved maximum packet rate grows as D increases. For every implementation, it is possible to determine an upper bound for the maximum packet rate. ITG-CV achieves the smallest upper bound (about 28000 pkt/s when D is at least 30) while the other three implementations perform better (about 30000 pkt/s when D is at least 40)

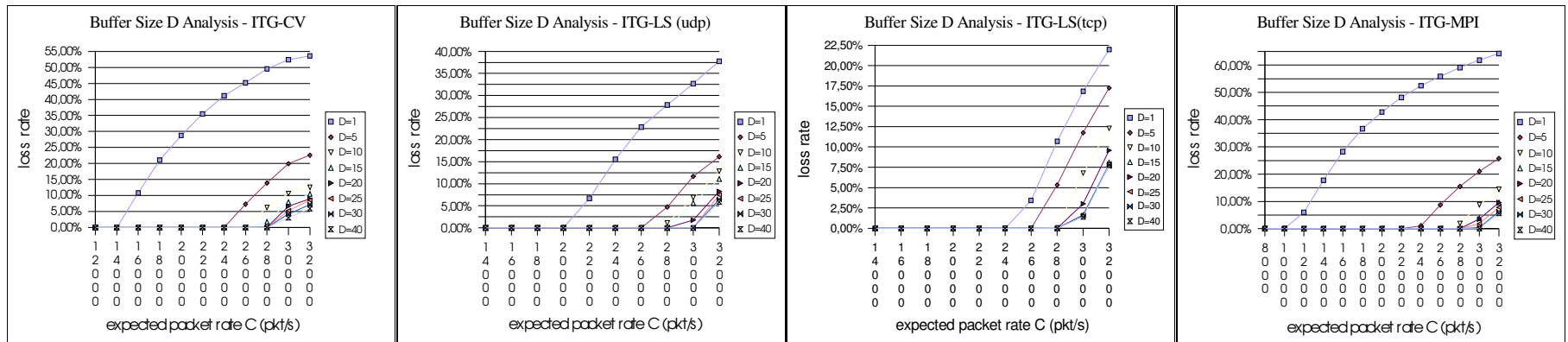


Figure 7. Sender Buffer Analysis ($c=512$; $t=60s$): this figure shows the percentage of packets the sender is not able to generate as a function of C , for different values of D . ITG-LS e ITG-MPI exhibit a similar behavior (a percentage error smaller than 2% for $C < 30000$ and $D=40$) and perform better than ITG-CV. In particular, it is possible to note that ITG-MPI and the UDP version of ITG-LS perform slightly better than the TCP version of ITG-LS (a percentage error almost null for $C=30000$ and $D=40$ against the percentage error of 1,5% achieved by the TCP version of ITG-Log)

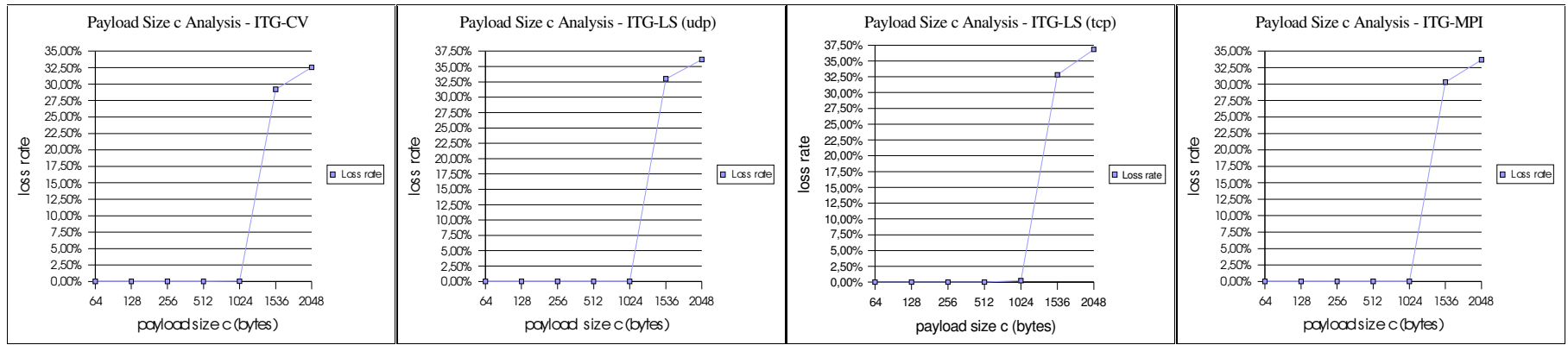


Figure 8. Sender Packet Size Analysis ($C=26000$ for ITG, $C=28000$ for ITG-LS and ITG-MPI; $t=60s$): this figure illustrates the percentage error as a function of c ; for all the implementations of D-ITG, the generation error is null for $c < 1024$. For values above this threshold, we can observe a considerable packet loss

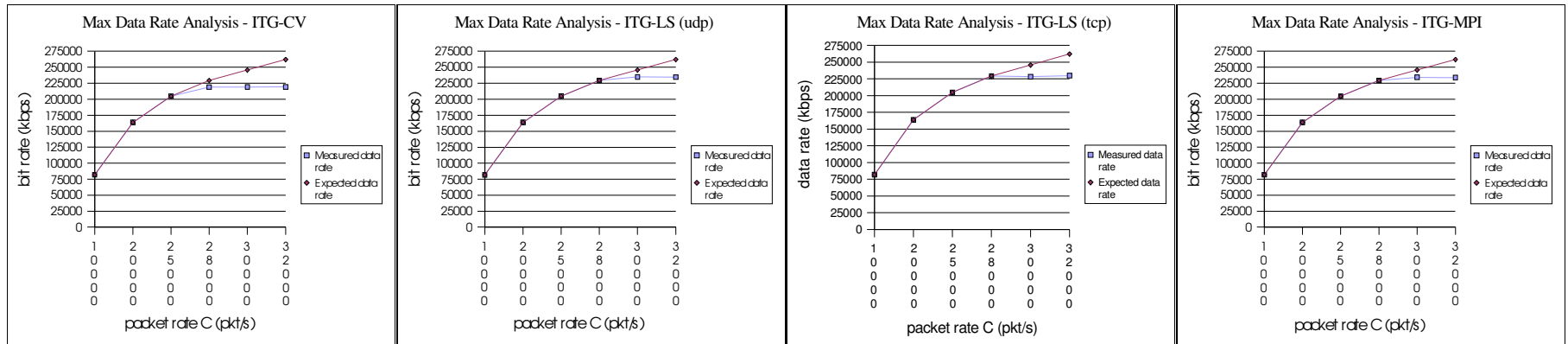


Figure 9. Sender Max Data Rate Analysis ($c=1024$; $D=40$): this figure depicts the generated data rate as a function of C , while D and c are equal to their optimal values. For all the implementations of D-ITG, it is possible to determine an upper bound to the generation rate. The smallest upper bound is achieved by ITG-CV and is about 218500 kbps. The other implementations perform similarly, having a maximum data rate equal to about 230000 kbps (that is, 5% greater)

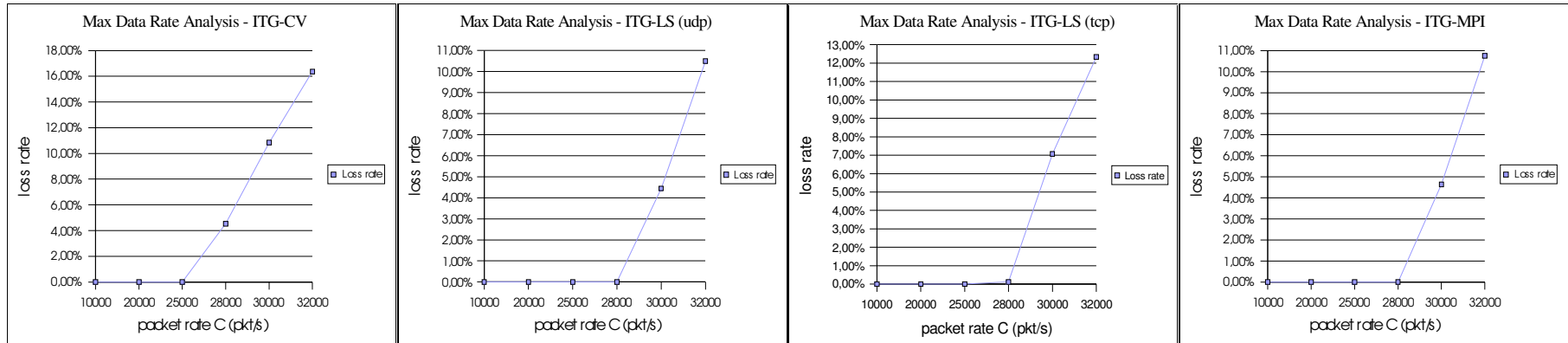


Figure 10. Sender Max Data Rate Analysis ($c=1024$; $D=40$): this figure shows the percentage generation error for the three implementations of D-ITG. We can observe that only ITG-MPI and the UDP version of ITG-LS achieve a generation error smaller than 5% when the expected packet rate is 300000 pkt/s (which corresponds to an actual data rate of 245760 kbps)

Receiver Analysis

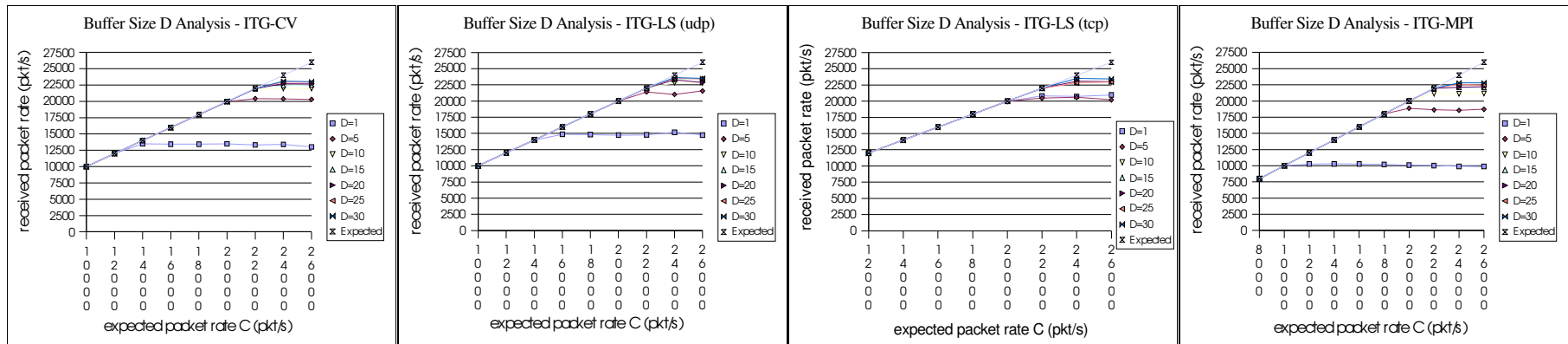


Figure 11. Receiver Buffer Size Analysis ($c=512$; $t=60s$): this figure represents the number of packets received by the different implementations of ITGRecv as a function of C , while increasing D . The maximum packet rate increases as D grows. For all the implementations, it is possible to calculate an upper bound. This value is similar for all the component of D-ITG and is equal to 22000 pkt/s

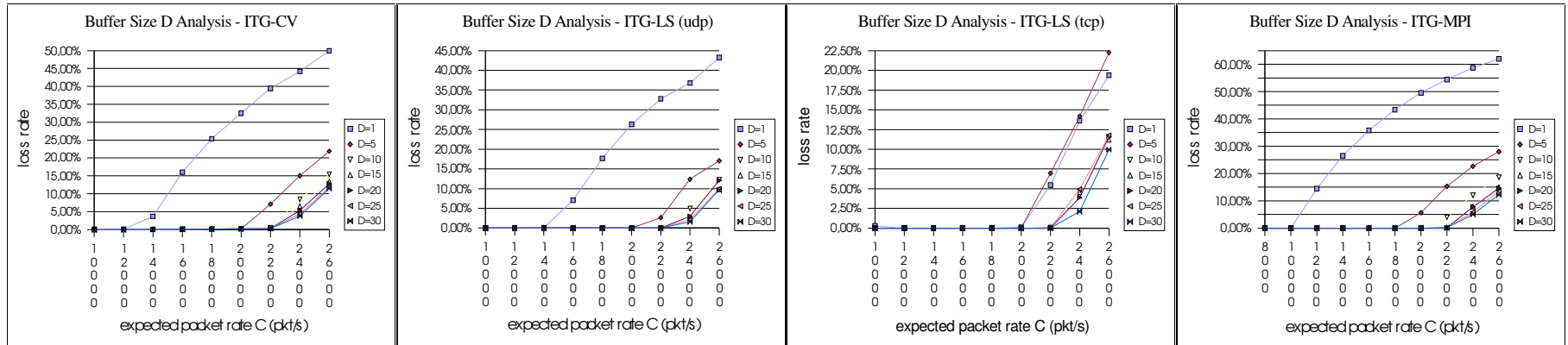


Figure 12. Receiver Buffer Analysis ($c=512$; $t=60s$): this figure illustrates the percentage of lost packets as a function of C for different values of D . The different implementations of D-ITG exhibit a similar behavior for $C < 22000$

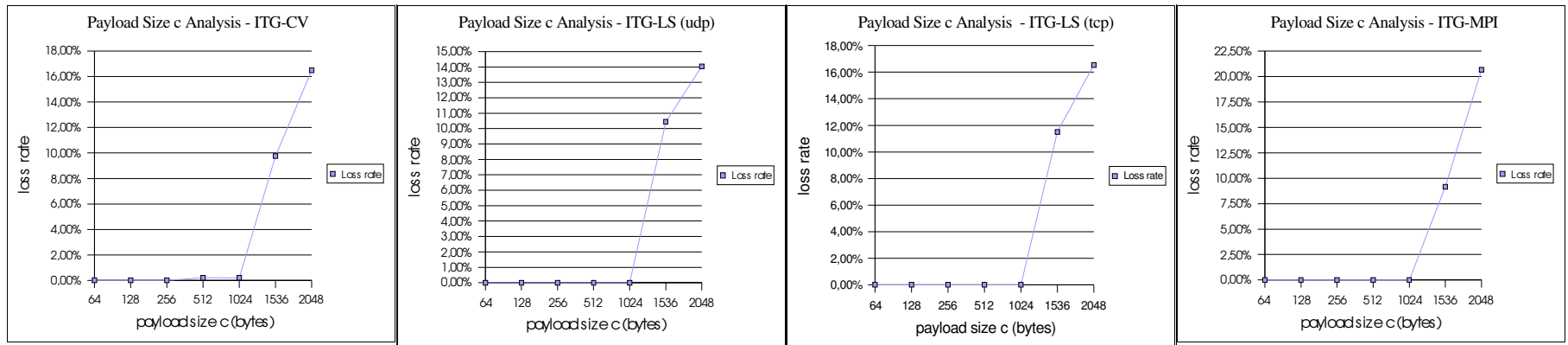


Figure 13. Receiver Packet Size Analysis ($C=20000$; $t=60s$): this figure shows the percentage error (percentage of packets not received) as a function of c . For all the implementations of D-ITG, the percentage error is null for $c < 1024$. For values above this threshold, we can observe a considerable packet loss

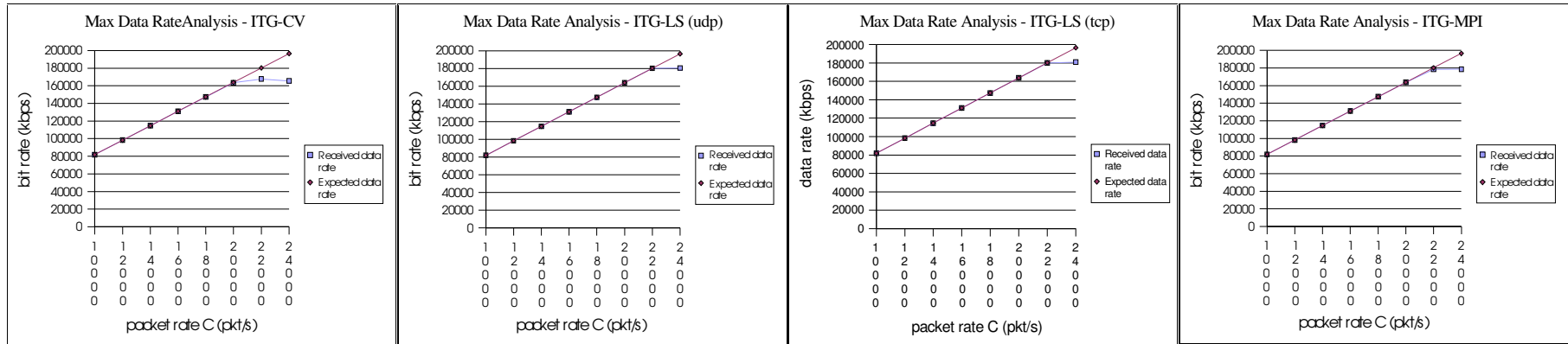


Figure 14. Receiver Max Data Rate Analysis ($c=1024$; $D=40$): this figure depicts the received data rate as a function of C , while D and c are equal to their optimal values. For all the implementations of D-ITG, it is possible to determine an upper bound to the received rate. The smallest value is achieved by ITG-CV and is about 165000 kbps. The two versions of ITG-LS and ITG-MPI exhibit a similar behavior and their upper bound is about 180000 kbps. The gain achieved with respect to ITG-CV is about 10%.

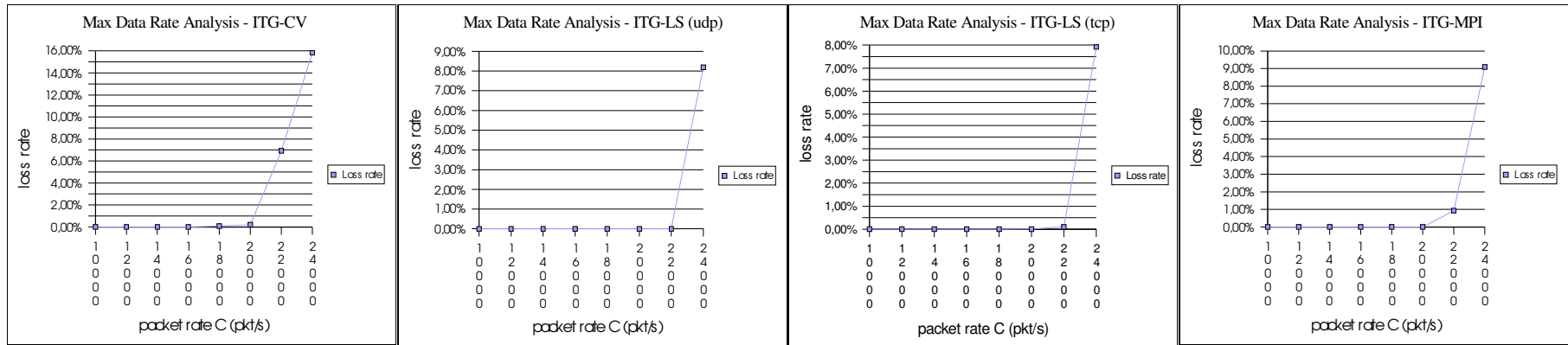


Figure 15. Receiver Max Data Rate Analysis ($c=1024$; $D=40$): this figure shows the percentage of lost packets for the three implementations of D-ITG. The two versions of ITG-LS and ITG-MPI exhibit a null error rate for $C < 22000$. ITG-LS presents a loss rate of 7% for $C = 22000$. For C above this value, the error rate grows, but it is still below 8% for $C = 24000$ for the two versions of ITG-LS