Anexo 2

Resultados de las pruebas del Capítulo IV

Pruebas con Iperf 1.6.5

Tabla A2.1 Pruebas con Iperf 1.6.5

	TCP		SCTP	
Tiempo	Transfer (MB)	Bandwidth (Mbps)	Transfer (MB)	Bandwidth (Mbps)
10	112	94.1	110	92.5
10	112	94.1	109	91.7
10	112	94.2	110	92.4
10	112	94	110	92
10	112	94.1	110	92.5
10	112	94.2	110	92.8
10	112	94.1	109	91.8
10	112	94.2	110	92.4
10	112	94	109	91.7
10	112	93.8	110	92.5
10	112	94.2	111	93
10	112	94.1	110	92.4
10	112	93.9	109	91.7
10	112	94	110	92.8
10	112	94.1	110	92.5
10	112	94.1	110	92.4
10	112	94	110	92.5
10	112	94.2	110	92.4

Figura A2.1 SCTP vs TCP Cantidad de datos transmitidos

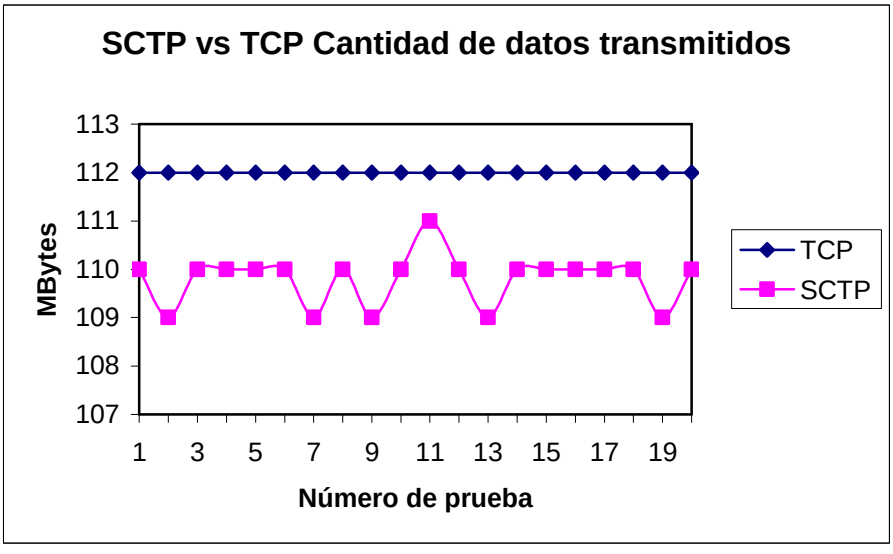


Figura A2.2 SCTP vs TCP Tasa de Transfernecia

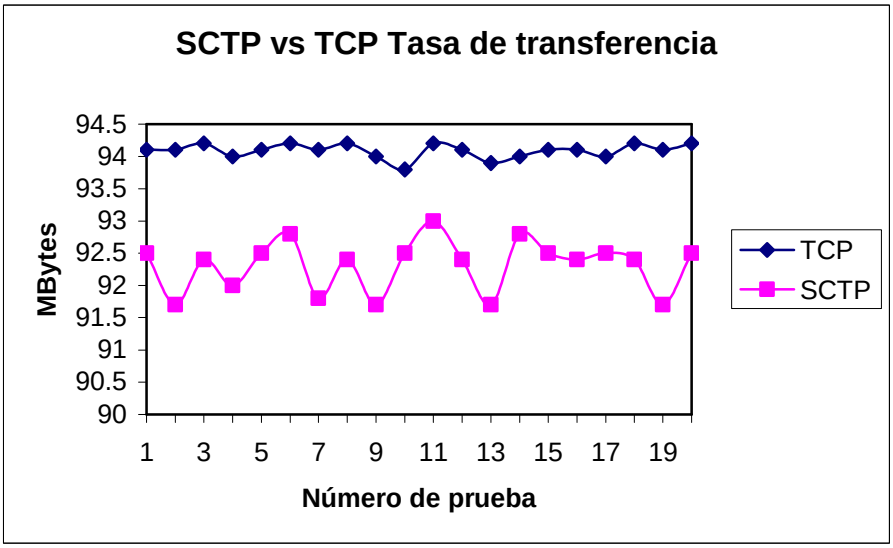


Figura A2.3 Salida del terminal usando iperf 1.6.5

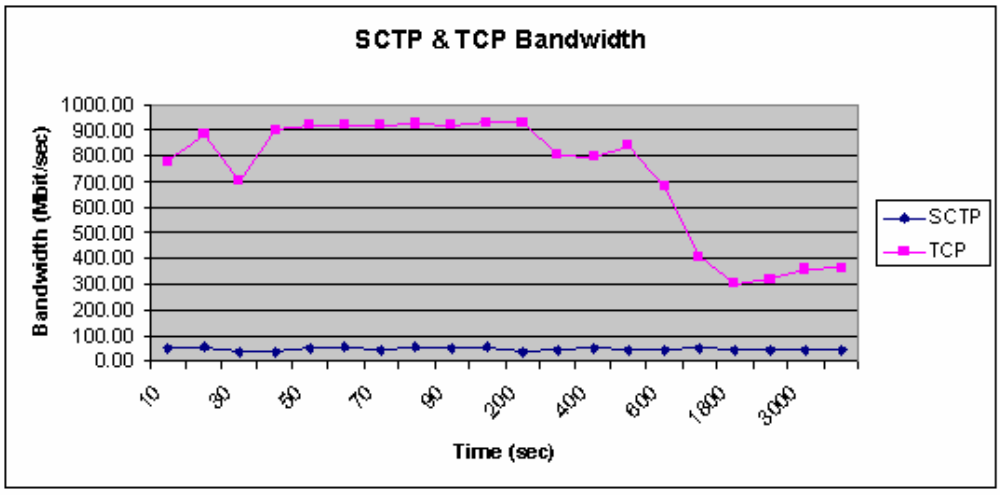
```
isaac@isaac-laptop:~/iperf-1.6.5-hb-lksctp$ ./iperf -c 192.168.203.222
In TCP mode
------------------------------------------------------------
Client connecting to 192.168.203.222, TCP port 5001
TCP window size: 16.0 KByte (default)
------------------------------------------------------------
[  3] local 192.168.203.111 port 40986 connected with 192.168.203.222 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec   112 MBytes  94.1 Mbits/sec
close failed: Bad file descriptor

isaac@isaac-laptop:~/iperf-1.6.5-hb-lksctp$ ./iperf -c 192.168.203.222 -z
sctp selected
In SCTP mode
------------------------------------------------------------
Client connecting to 192.168.203.222, SCTP port 5001
TCP window size:  108 KByte (default)
------------------------------------------------------------
[  3] local 192.168.203.111 port 32768 connected with 192.168.203.222 port 5001
[ ID] Interval       Transfer     Bandwidth
[  3]  0.0-10.0 sec   110 MBytes  92.5 Mbits/sec
close failed: Bad file descriptor
```

Tabla A2.2 Pruebas con Iperf 1.6.5 desde Geneva hacia Chicago de un enlace de 1Gbps

LKSCTP	SCTP		TCP	
Time	Transfer (Mbytes)	Bandwidth (Mbit/s)	Transfer (Mbytes)	Bandwidth (Mbit/s)
10	63.9	52.3	921	777
20	127	53	2060	882
30	138	38.6	2480	705
40	177	37	4190	899
50	308	51.3	5340	918
60	383	53.3	6420	917
70	351	42	7520	922
80	511	53.4	8610	925
90	552	51.5	9650	921
100	640	53.5	10800	930
200	863	36.2	21700	930
300	1490	42.6	32500	801
400	2420	52	37100	796
500	2460	42.2	49000	842
600	2990	42.8	47200	676
1200	6810	48.8	57000	408
1800	8960	42.7	63600	303
2400	12500	44.6	90500	324
3000	15700	45	125000	357
3600	18740	44.25	152000	363

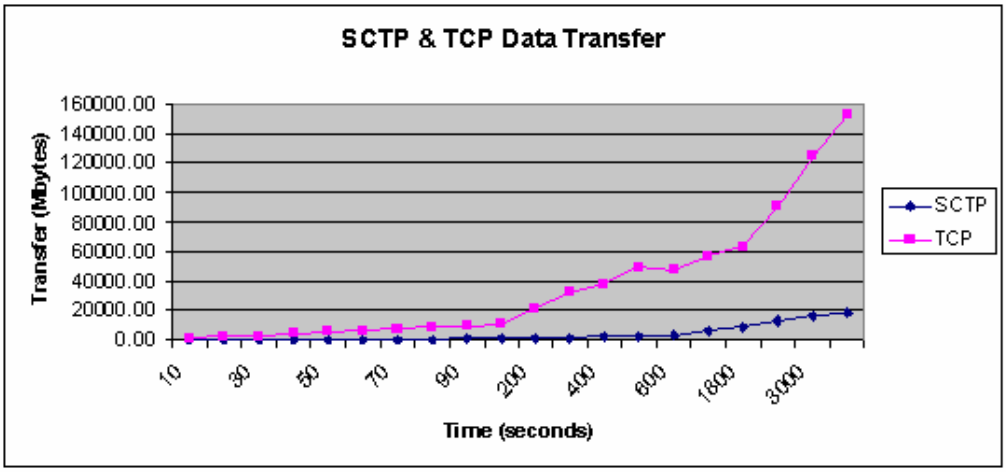
Tomado de http://datatag.web.cern.ch/datatag/WP3/sctp/tests.htm

Figura A2.3 SCTP vs TCP Cantidad de datos transmitidos (Enlace Geneva-Chicago)



Tomado de http://datatag.web.cern.ch/datatag/WP3/sctp/tests.htm

Figura A2.4 SCTP vs TCP Tasa de transferencia (Enlace Geneva-Chicago)



Tomado de http://datatag.web.cern.ch/datatag/WP3/sctp/tests.htm

Pruebas con EchoTools1.0

✓Resultados de la variación del tamaño de mensajes -Latencia Media (seg)

Tabla A2.3 Variando el tamaño de mensajes -Latencia Media (seg)

Latencia Media (seg)

	10 bytes	20 bytes	30 bytes	40 bytes	50 bytes	60 bytes	70 bytes	80 bytes	90 bytes	100 bytes
TCP	0.0059	0.0060	0.0061	0.0077	0.0093	0.0079	0.0081	0.0082	0.0071	0.0061
SCTP 1 stream	0.0025	0.0026	0.0027	0.0032	0.0038	0.0043	0.0048	0.0053	0.0045	0.0036
SCTP 10 streams	0.0043	0.0024	0.0004	0.0004	0.0004	0.0025	0.0035	0.0046	0.0050	0.0054
SCTP 50 streams	0.0005	0.0004	0.0004	0.0004	0.0004	0.0030	0.0043	0.0056	0.0050	0.0043
SCTP 100 streams	0.0004	0.0003	0.0003	0.0018	0.0034	0.0033	0.0041	0.0048	0.0040	0.0032
SCTP 150 streams	0.0005	0.0005	0.0004	0.0004	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004
SCTP 200 streams	0.0010	0.0007	0.0003	0.0010	0.0016	0.0007	0.0006	0.0004	0.0004	0.0004
SCTP 250 streams	0.0004	0.0004	0.0004	0.0013	0.0022	0.0008	0.0006	0.0004	0.0005	0.0006
SCTP 300 streams	0.0003	0.0008	0.0013	0.0015	0.0017	0.0038	0.0049	0.0061	0.0059	0.0057

Figura A2.4 Variando el tamaño de mensajes -Latencia Media

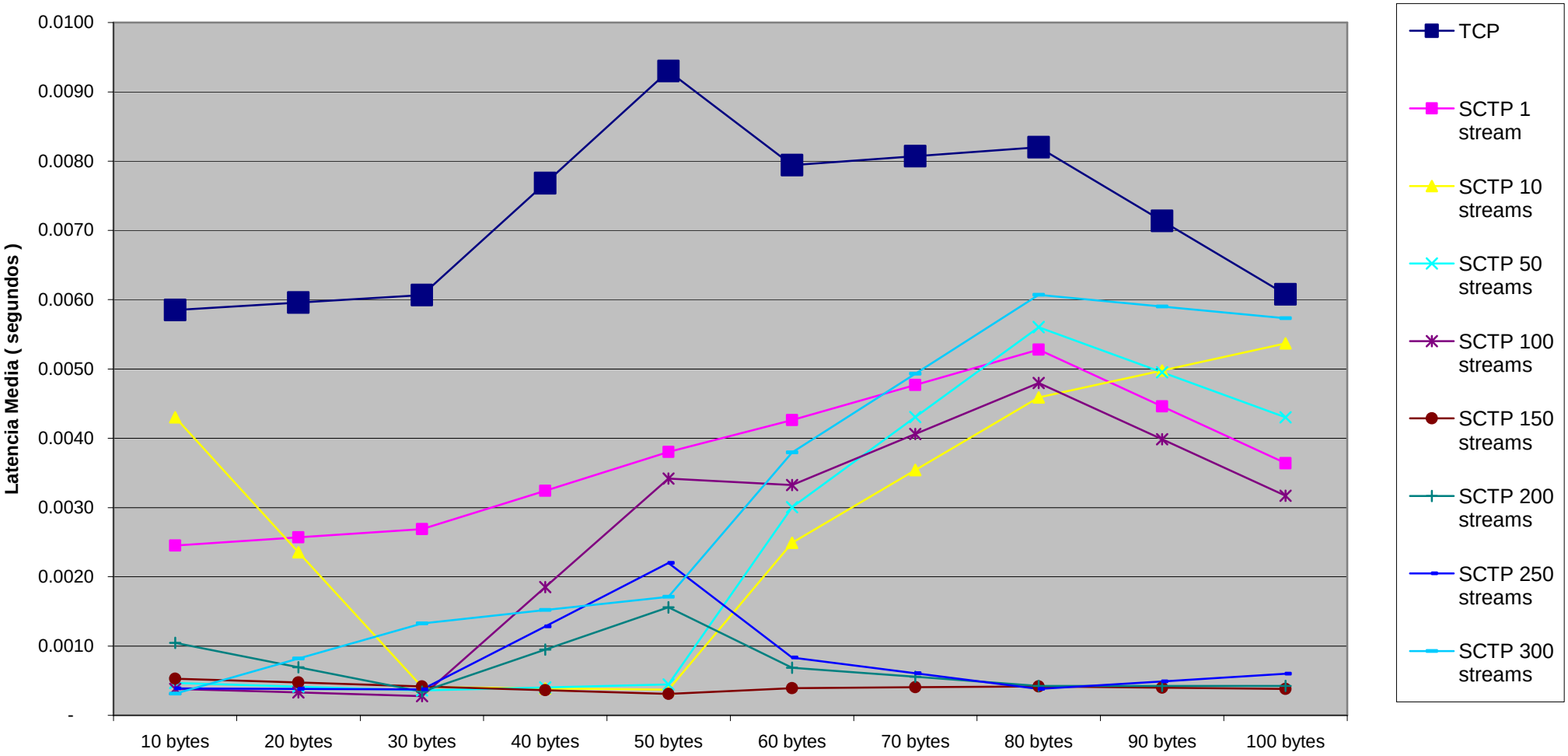


Figura A2.5 Variando el tamaño de mensajes -Latencia Media

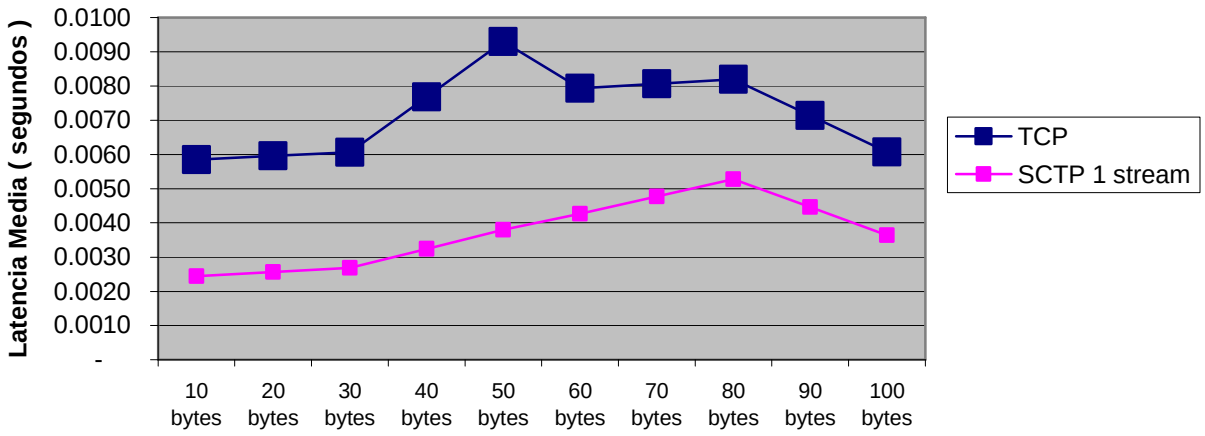


Figura A2.6 Variando el tamaño de mensajes -Latencia Media

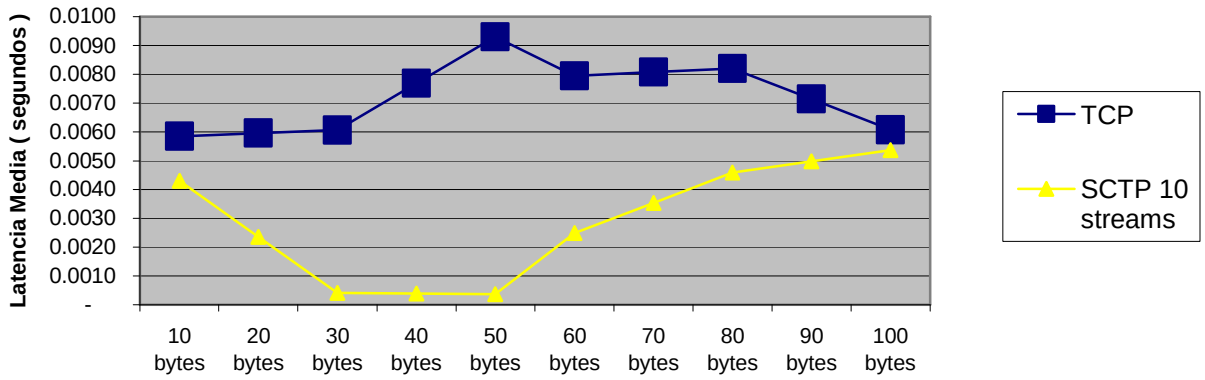


Figura A2.7 Variando el tamaño de mensajes -Latencia Media

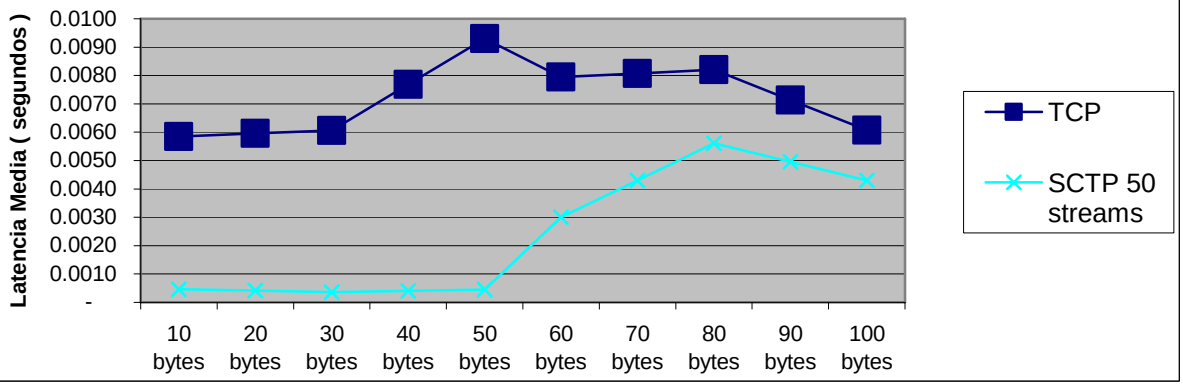


Figura A2.8 Variando el tamaño de mensajes -Latencia Media

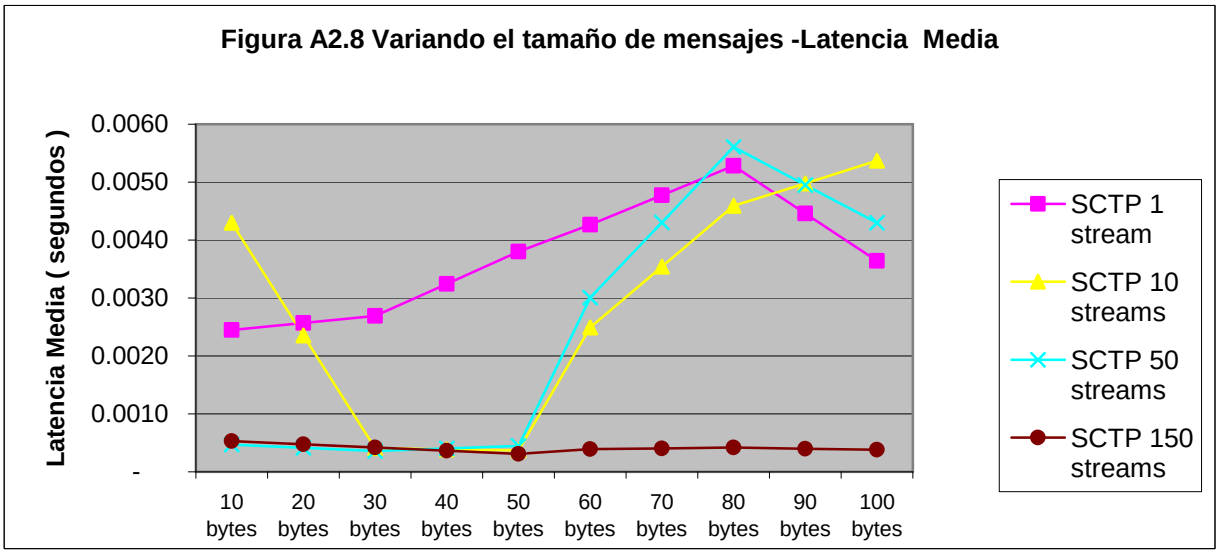
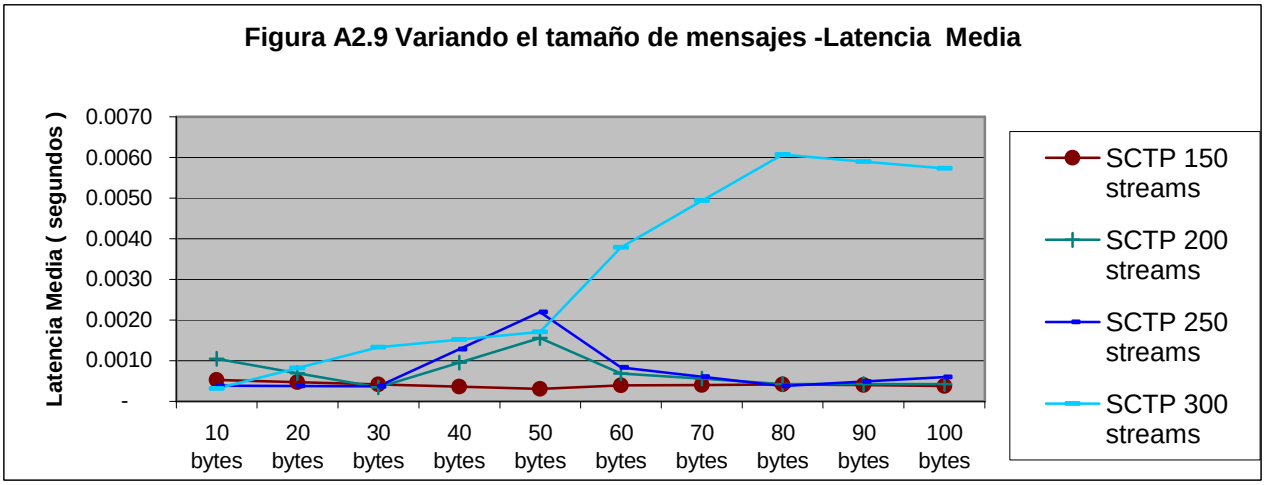


Figura A2.9 Variando el tamaño de mensajes -Latencia Media



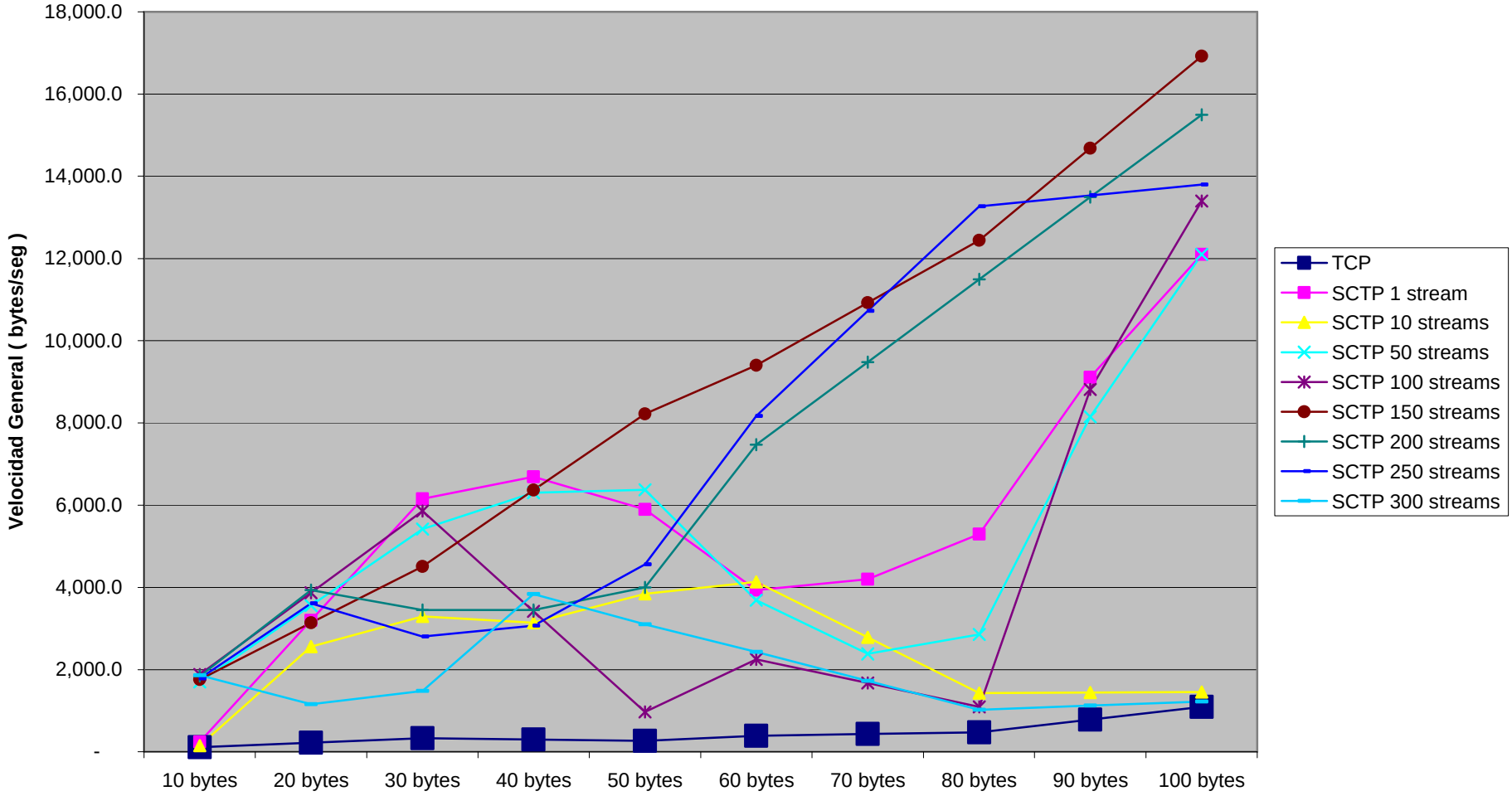
✓ Resultados de la variación del tamaño de mensajes - Velocidad General (kbytes/seg)

Tabla A2.4 Variando el tamaño de mensajes –Velocidad General (kbytes/seg)

Velocidad General (Kbps)

	10 bytes	20 bytes	30 bytes	40 bytes	50 bytes	60 bytes	70 bytes	80 bytes	90 bytes	100 bytes
TCP	108.5	218.0	327.4	297.3	267.1	386.2	430.7	475.2	785.2	1,095.2
SCTP 1 stream	238.5	3,196.2	6,153.9	6,688.4	5,900.0	3,934.9	4,200.0	5,300.0	9,114.2	12,100.0
SCTP 10 streams	148.6	2,551.8	3,290.0	3,140.0	3,840.0	4,130.4	2,780.5	1,430.5	1,442.9	1,455.4
SCTP 50 streams	1,699.6	3,560.5	5,421.5	6,300.9	7,180.3	3,688.2	2,381.8	1,075.5	8,147.8	12,100.0
SCTP 100 streams	1,884.0	3,870.9	5,857.8	3,413.0	968.2	2,253.6	1,673.9	1,094.1	8,815.1	13,400.0
SCTP 150 streams	1,759.9	3,135.5	4,511.2	6,364.8	8,218.4	9,403.9	10,923.4	12,443.0	14,683.9	16,924.8
SCTP 200 streams	1,841.3	3,934.1	6,026.8	3,444.9	863.0	7,468.6	9,480.5	11,492.3	13,495.5	15,498.7
SCTP 250 streams	1,785.3	3,612.0	5,438.7	3,066.2	693.7	8,170.1	10,722.0	13,273.9	13,535.1	13,796.2
SCTP 300 streams	1,863.2	1,158.7	454.3	3,832.7	3,100.0	2,427.8	1,725.4	1,023.0	1,123.7	1,224.5

Figura A2.10 Variando el tamaño de mensajes - Velocidad General



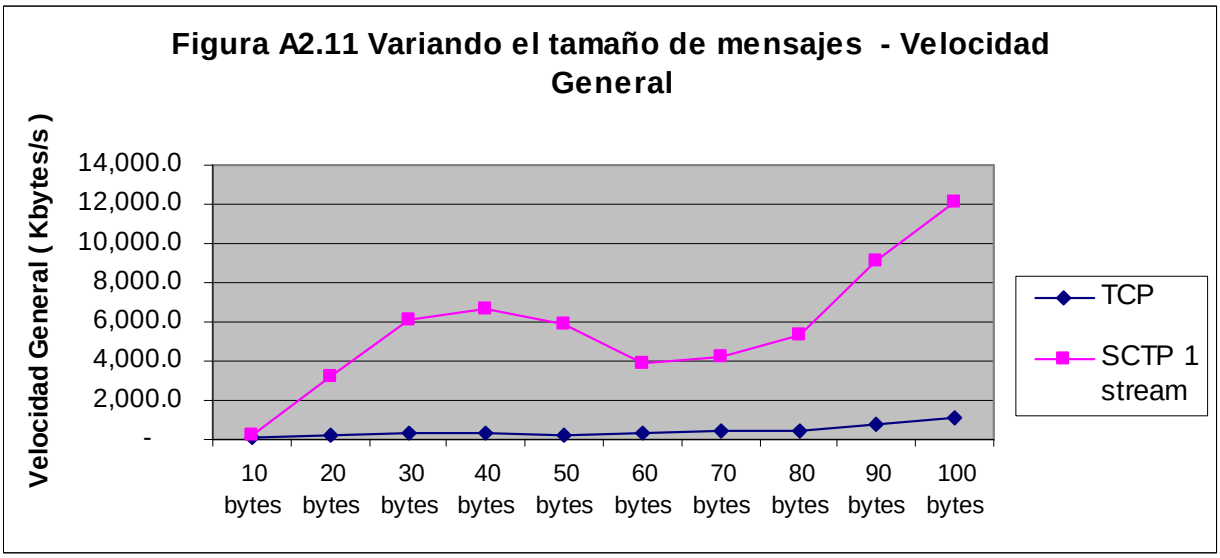


Figura A2.11 Variando el tamaño de mensajes - Velocidad General
Velocidad General (Kbytes/s)
14,000.0
12,000.0
10,000.0
8,000.0
6,000.0
4,000.0
2,000.0
-
10 bytes
20 bytes
30 bytes
40 bytes
50 bytes
60 bytes
70 bytes
80 bytes
90 bytes
100 bytes
TCP
SCTP 1 stream

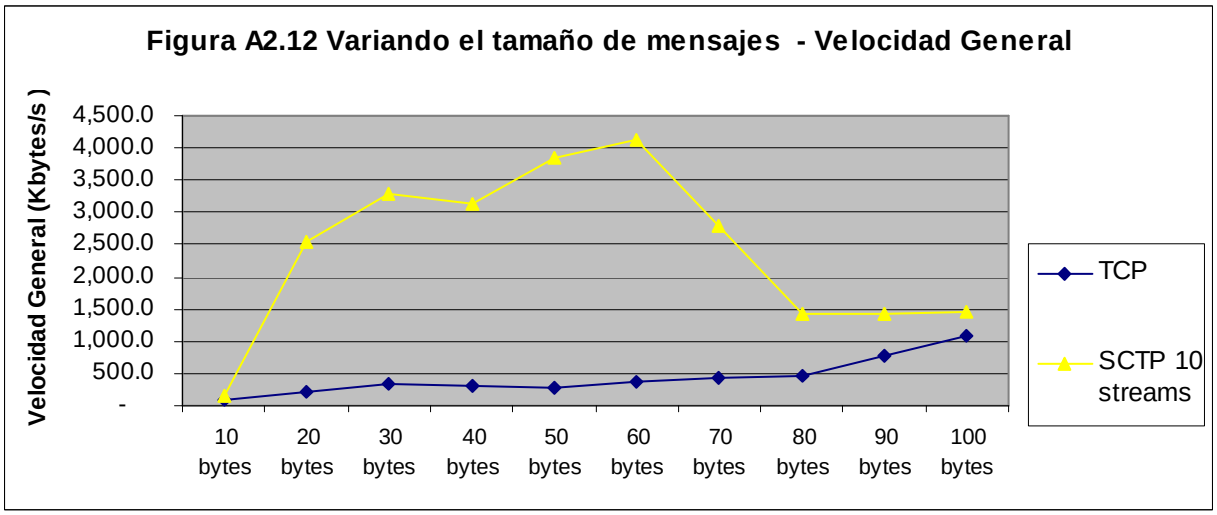


Figura A2.12 Variando el tamaño de mensajes - Velocidad General
Velocidad General (Kbytes/s)
4,500.0
4,000.0
3,500.0
3,000.0
2,500.0
2,000.0
1,500.0
1,000.0
500.0
-
10 bytes
20 bytes
30 bytes
40 bytes
50 bytes
60 bytes
70 bytes
80 bytes
90 bytes
100 bytes
TCP
SCTP 10 streams

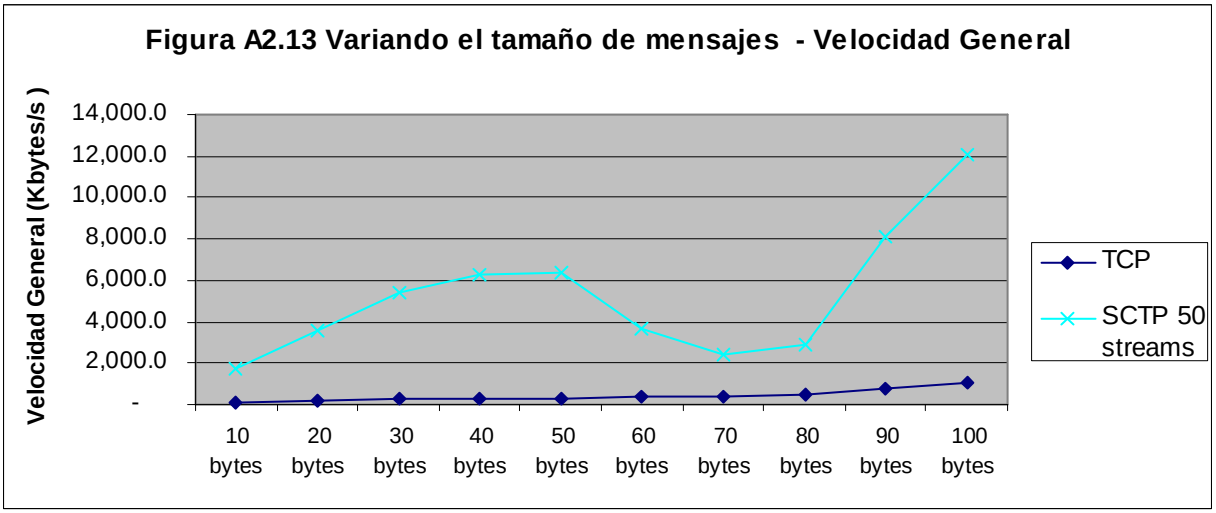


Figura A2.13 Variando el tamaño de mensajes - Velocidad General
Velocidad General (Kbytes/s)
14,000.0
12,000.0
10,000.0
8,000.0
6,000.0
4,000.0
2,000.0
-
10 bytes
20 bytes
30 bytes
40 bytes
50 bytes
60 bytes
70 bytes
80 bytes
90 bytes
100 bytes
TCP
SCTP 50 streams

Figura A2.14 Variando el tamaño de mensajes - Velocidad General

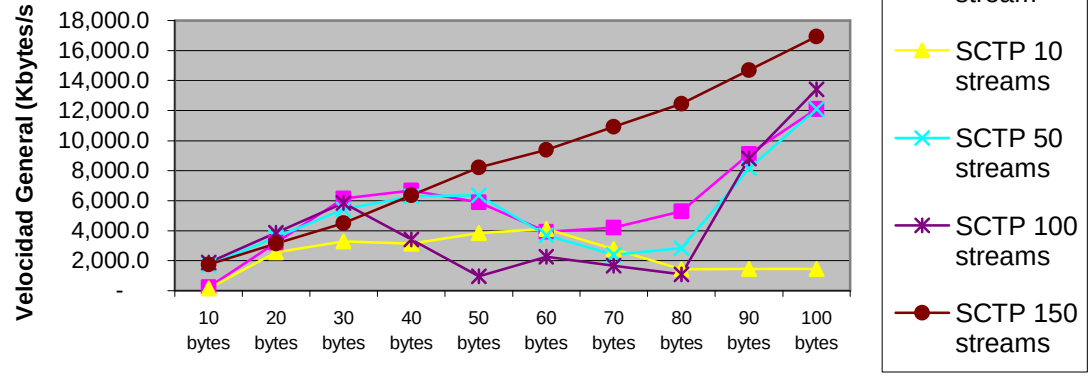
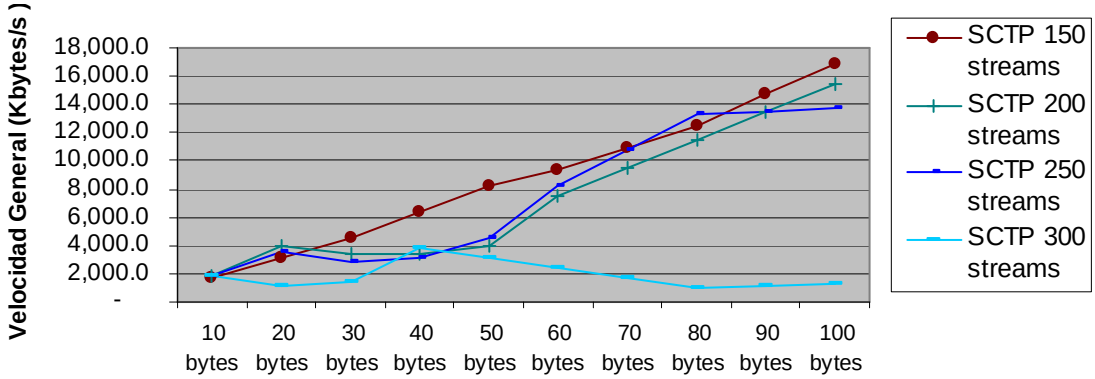


Figura A2.15 Variando el tamaño de mensajes - Velocidad General



✓Resultados de la variación del número de mensajes – Latencia Media(seg)

Tabla A2.5 Variando el número de mensajes -Latencia Media (seg)

Latencia Media (seg)

	10 msg	20 msg	30 msg	40 msg	50 msg	60 msg	70 msg	80 msg	90 msg	100 msg
TCP	0.0101	0.0120	0.0138	0.0128	0.0117	0.0112	0.0104	0.0097	0.0084	0.0071
SCTP 1 stream	0.0042	0.0046	0.0050	0.0051	0.0053	0.0050	0.0050	0.0049	0.0048	0.0047
SCTP 10 streams	0.0008	0.0023	0.0038	0.0021	0.0004	0.0012	0.0008	0.0004	0.0010	0.0016
SCTP 50 streams	0.0026	0.0033	0.0040	0.0022	0.0004	0.0013	0.0009	0.0004	0.0004	0.0004
SCTP 100 streams	0.0096	0.0087	0.0077	0.0061	0.0045	0.0058	0.0056	0.0055	0.0029	0.0004
SCTP 150 streams	0.0007	0.0006	0.0005	0.0032	0.0058	0.0042	0.0048	0.0053	0.0044	0.0035
SCTP 200 streams	0.0007	0.0006	0.0005	0.0005	0.0005	0.0028	0.0039	0.0051	0.0047	0.0043
SCTP 250 streams	0.0007	0.0006	0.0005	0.0005	0.0004	0.0027	0.0039	0.0050	0.0046	0.0042
SCTP 300 streams	0.0008	0.0038	0.0069	0.0057	0.0045	0.0051	0.0048	0.0045	0.0048	0.0052

Figura A2.16 Variando el número de los mensajes - Latencia Media

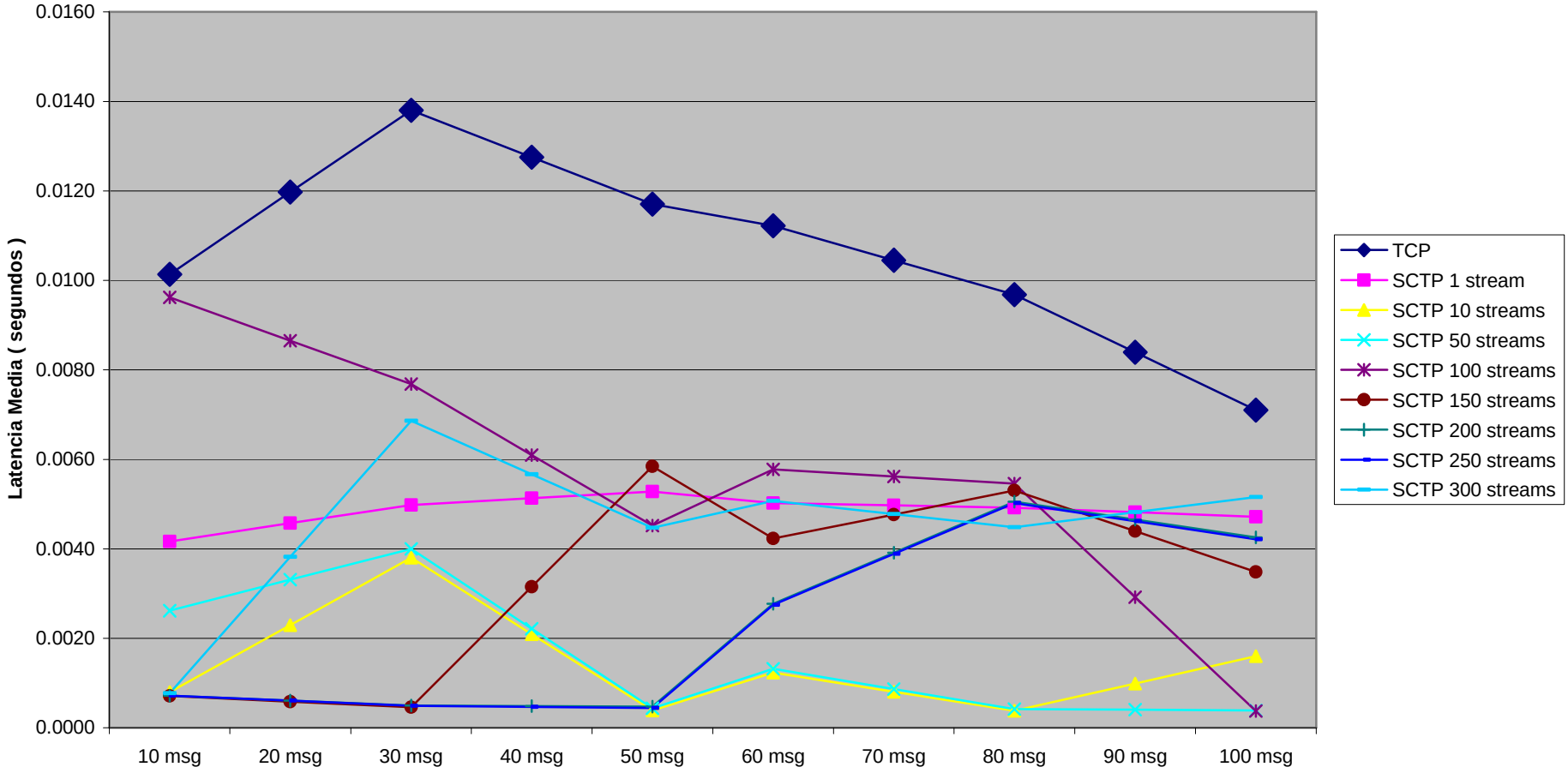


Figura A2.17 Variando el número de los mensajes - Latencia Media

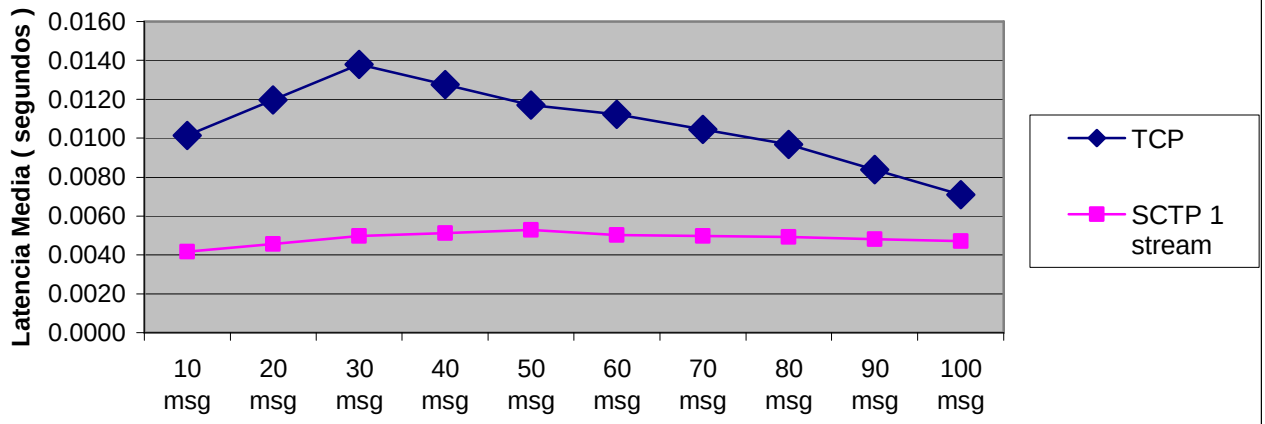


Figura A2.18 Variando el número de los mensajes - Latencia Media

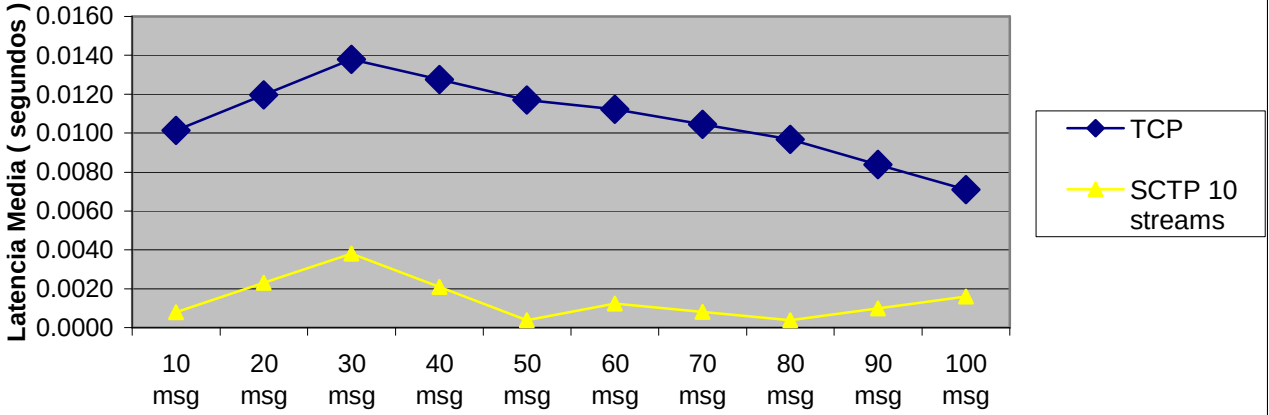


Figura A2.19 Variando el número de los mensajes - Latencia Media

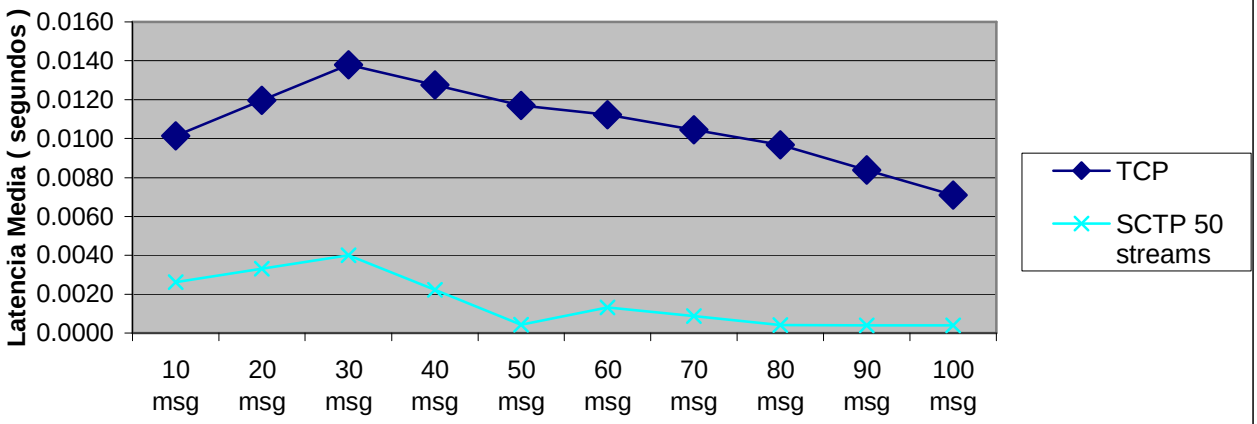


Figura A2.20 Variando el número de los mensajes - Latencia Media

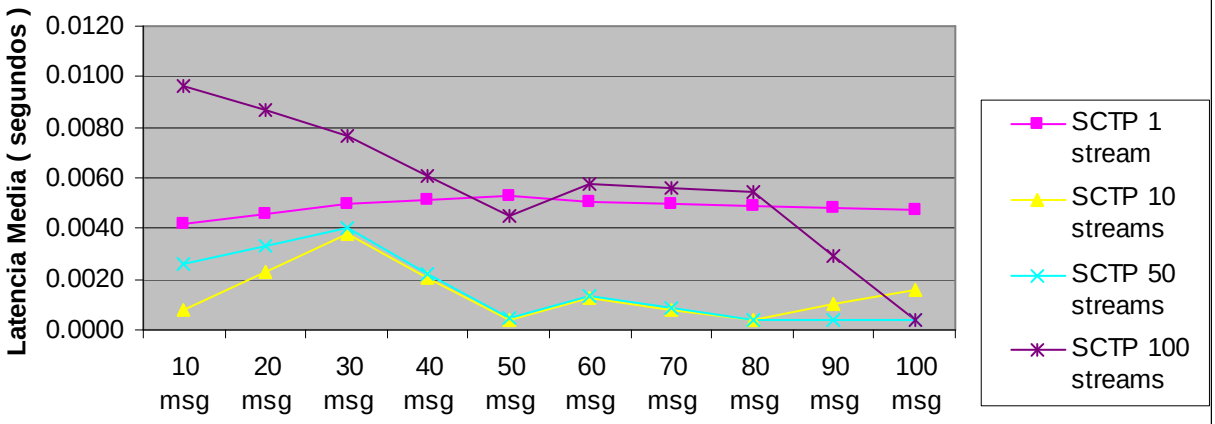
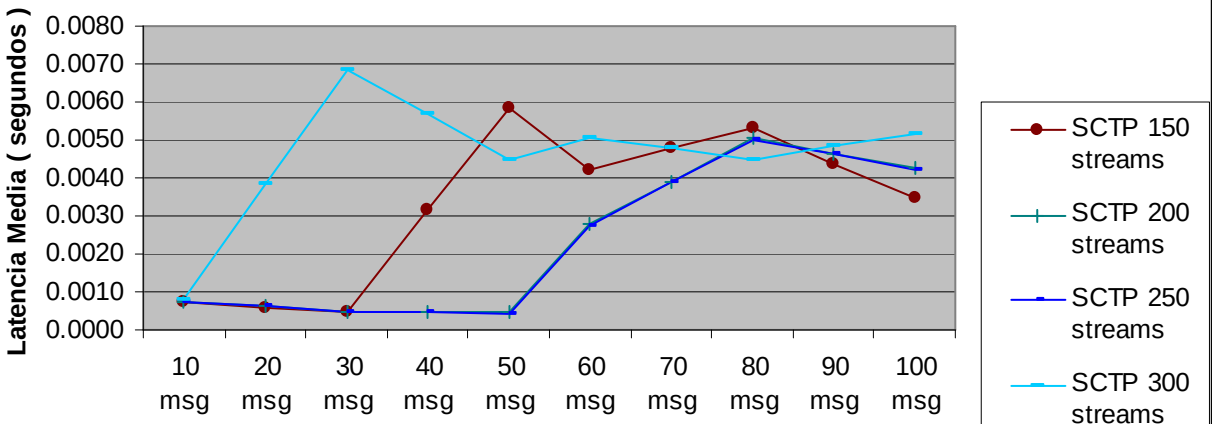


Figura A2.21 Variando el número de los mensajes - Latencia Media



✓ Resultados de la variación del número de mensajes - Velocidad General (kbytes/seg)

Tabla A2.6 Variando el número de mensajes - Velocidad General (kbytes/s)

Velocidad General (Kbps)

	10 msg	20 msg	30 msg	40 msg	50 msg	60 msg	70 msg	80 msg	90 msg	100 msg
TCP	143	179	216	671	1127	783	839	894	1543	2192
SCTP 1 stream	1255	1480	1705	1557	1409	1836	1975	2115	2393	2671
SCTP 10 streams	2211	1441	671	8570	16470	16795	20907	25020	24000	27700
SCTP 50 streams	995	926	857	7841	14826	15402	19182	22962	26166	29370
SCTP 100 streams	512	618	724	1347	1971	1623	1762	1900	16327	30755
SCTP 150 streams	2964	6420	9875	5470	1064	3754	2896	2038	16781	31524
SCTP 200 streams	2718	5371	8025	10702	13379	6371	4206	2040	2991	3941
SCTP 250 streams	2688	5416	8144	10741	13338	6584	4506	2427	3313	4198
SCTP 300 streams	2288	1610	932	1614	2295	1910	2059	2207	2414	2622

Figura A2.22 Variando el número de los mensajes - Velocidad General

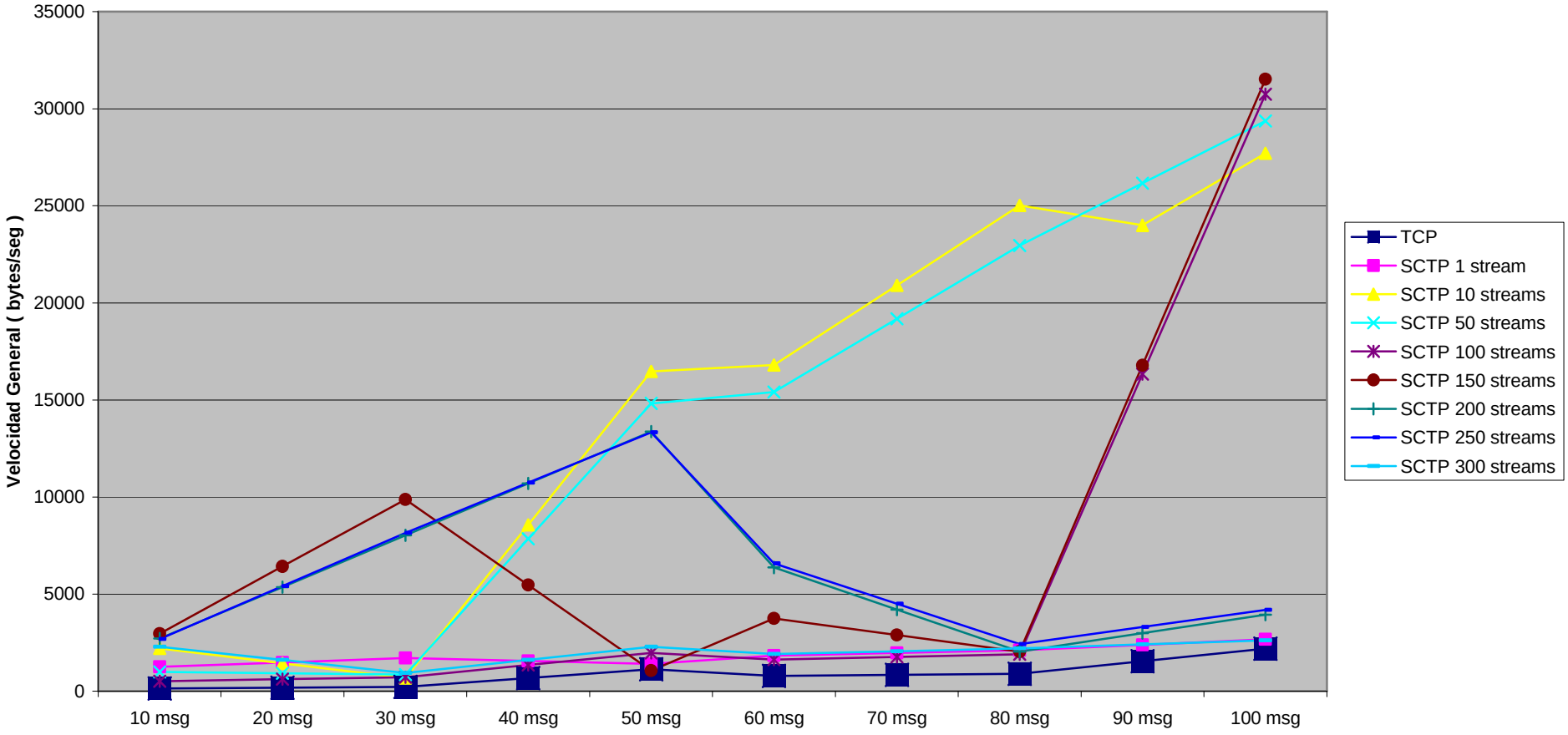


Figura A2.23 Variando el número de los mensajes - Velocidad General

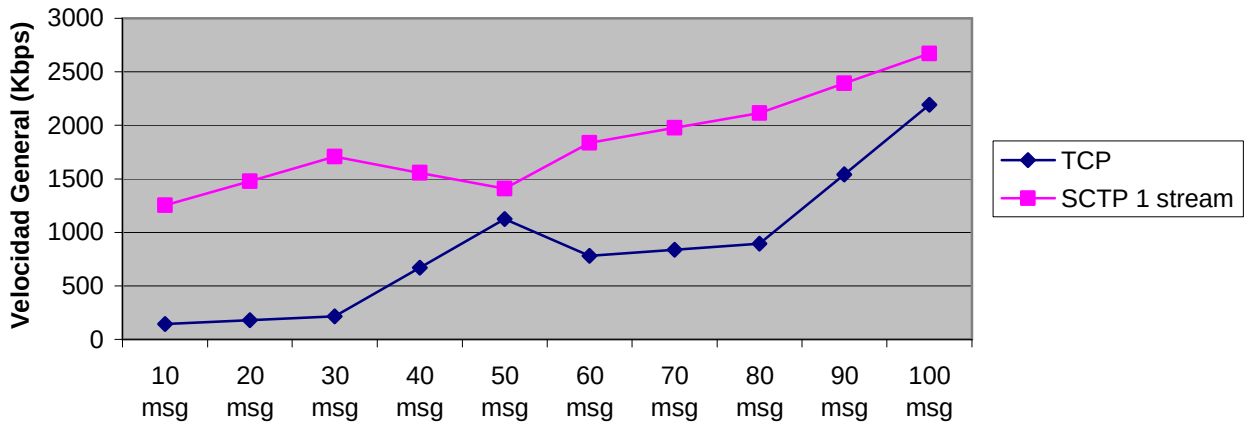


Figura A2.24 Variando el número de los mensajes - Velocidad General

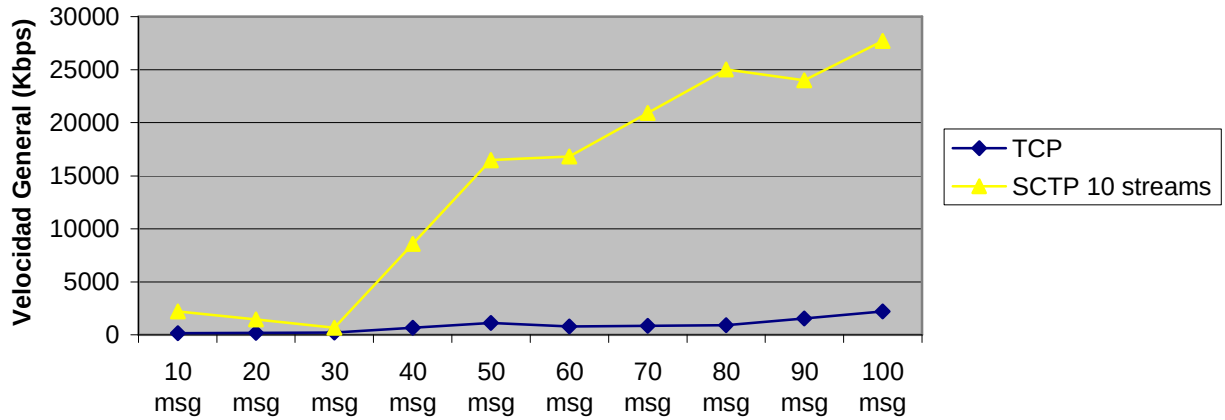


Figura A2.25 Variando el número de los mensajes - Velocidad General

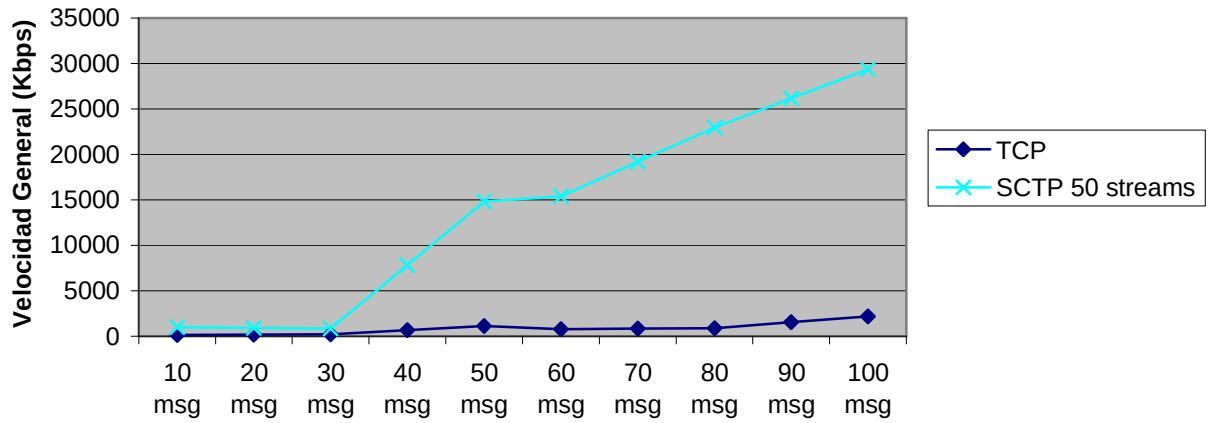


Figura A2.26 Variando el número de los mensajes - Velocidad General

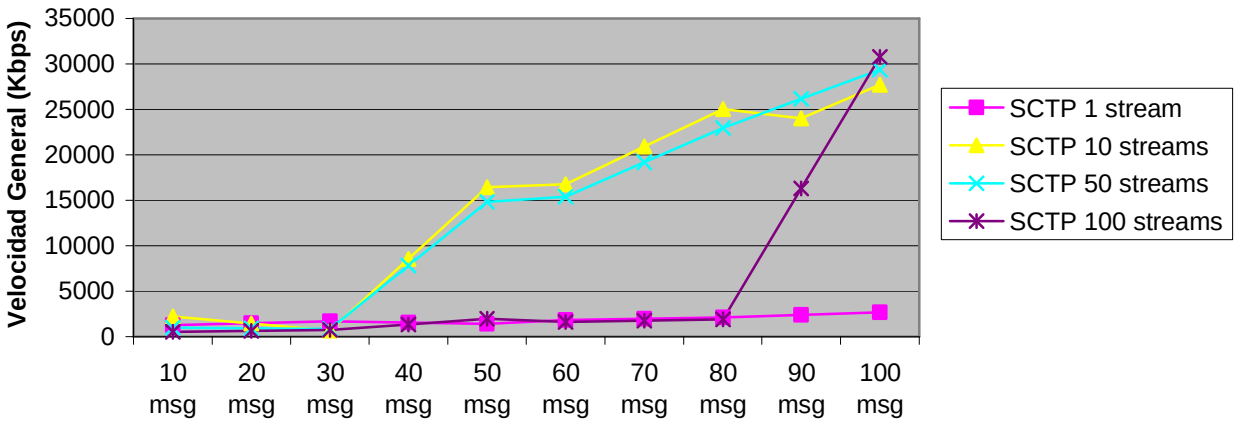


Figura A2.27 Variando el número de los mensajes - Velocidad General

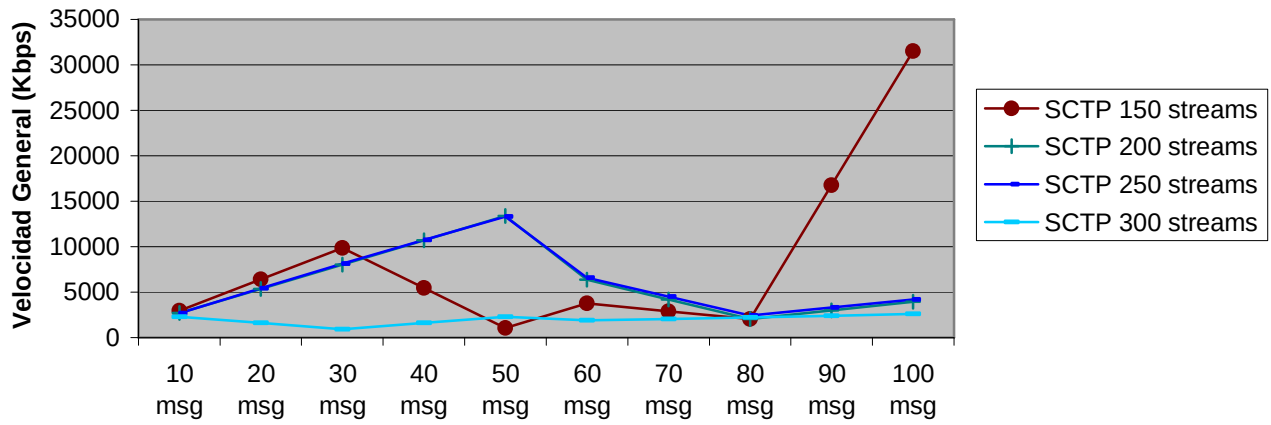


Figura A2.28 ESCENARIO DE PRUEBAS EN EL LABORATORIO V203-PUCP

Figura A2.29 ESCENARIO DE PRUEBAS EN EL LABORATORIO V203-PUCP

En el caso del cliente utilizamos un PC con las siguientes características:

Laptop Dell Inspiron 710m
Procesador Pentium M de 2GHz
Memoria RAM de 1GB
Tarjeta de red Broadcom 440x 10/100 Integrated

En el caso del servidor usamos un PC con las siguientes características:

Laptop Acer
Procesador Celeron 1.7GHz
Memoria RAM de 512MB
Tarjeta de red Broadcom 440x 10/100 Integrated

En el caso del conmutador utilizamos uno con las siguientes características:

Accelar 1200
48 puertos 10/100 Integrated

Pruebas con SCTPperf1.0

Figura A2.30 SCTPperf sobre ethernet

```
isaac@isaac-laptop:~/sctpperf_0.1$ ./scptperf_clnt -P 1111 -H 192.168.203.111 -p 2222 -h
192.168.203.222 -l 1000 -t 5 -x 1 -m 50 -f 100 >>clnt11.txt
Local host:               192.168.203.111
Local port:               1111
Remote host:              192.168.203.222
Remote port:              2222
Packet size:              1000
Measure period:           5
Print period:             1
Streams:                  50
Sender buffer:            102400
Receiver buffer:          102400
Verbose:                  0
Binding single address
[2007/07/19 18:35:33] 1s_BDW = 88.054214 Mbits/s, PACKETS = 11543, TIME = 1 sec 135 usec
[2007/07/19 18:35:34] 1s_BDW = 87.807480 Mbits/s, PACKETS = 11510, TIME = 1 sec 78 usec
[2007/07/19 18:35:35] 1s_BDW = 87.666130 Mbits/s, PACKETS = 11491, TIME = 1 sec 37 usec
[2007/07/19 18:35:36] 1s_BDW = 87.804855 Mbits/s, PACKETS = 11509, TIME = 1 sec 21 usec
[2007/07/19 18:35:37] 1s_BDW = 87.805382 Mbits/s, PACKETS = 11509, TIME = 1 sec 15 usec
BANDWIDTH = 87.827621 Mbits/s, SIZE = 1000 bytes, SENT = 57562 packets
```

Figura A2.31 SCTPperf sobre wireless (802.11b)

```
isaac@isaac-laptop:~/sctpperf_0.1$ ./scptperf_clnt -P 1111 -H 192.168.0.100 -p 2222 -h
192.168.0.101 -l 1000 -t 5 -x 1 -m 50 -f 100 >>clnt12.txt
Local host:              192.168.0.100
Local port:              1111
Remote host:             192.168.0.101
Remote port:             2222
Packet size:             1000
Measure period:          5
Print period:            1
Streams:                 50
Sender buffer:           102400
Receiver buffer:         102400
Verbose:                 0
Binding single address
[2007/07/19 18:42:10] 1s_BDW = 0.380367 Mbits/s, PACKETS = 150, TIME = 3 sec 8699 usec
[2007/07/19 18:42:11] 1s_BDW = 0.966947 Mbits/s, PACKETS = 127, TIME = 1 sec 2054 usec
[2007/07/19 18:42:12] 1s_BDW = 1.042338 Mbits/s, PACKETS = 137, TIME = 1 sec 2772 usec
BANDWIDTH = 0.630010 Mbits/s, SIZE = 1000 bytes, SENT = 414 packets
```

Figura A2.32 SCTPperf sobre ethernet y *wireless* (802.11b) - *Multihoming*

```
flavio@flavio-laptop:~/Isaac_Tesis/sctpperf_0.1$ ./scptperf_srv -P 2222 -H 192.168.203.222 -B
192.168.0.101 -f 100

Local host:               192.168.203.222
Local port:               2222
Sender buffer:            102400
Receiver buffer:          102400
Verbose:                  0
Binding single address
Binding mutliple addresses from addr_buf[]
[2007/07/19 21:30:38.203262] 1s_BDW = 83.436073 Mbits/s, PACKETS = 422, TIME = 1 sec 5840 usec
[2007/07/19 21:30:39.209948] 1s_BDW = 85.639572 Mbits/s, PACKETS = 360, TIME = 1 sec 6686 usec
[2007/07/19 21:30:40.215061] 1s_BDW = 85.773598 Mbits/s, PACKETS = 360, TIME = 1 sec 5113 usec
[2007/07/19 21:30:41.219981] 1s_BDW = 85.790070 Mbits/s, PACKETS = 360, TIME = 1 sec 4920 usec
[2007/07/19 21:31:45.930857] 1s_BDW = 0.353699 Mbits/s, PACKETS = 60, TIME = 64 sec 710876 usec
BANDWIDTH = 5.300504 Mbits/s, SIZE = 100000 bytes, RECEIVED = 1568 packets
```