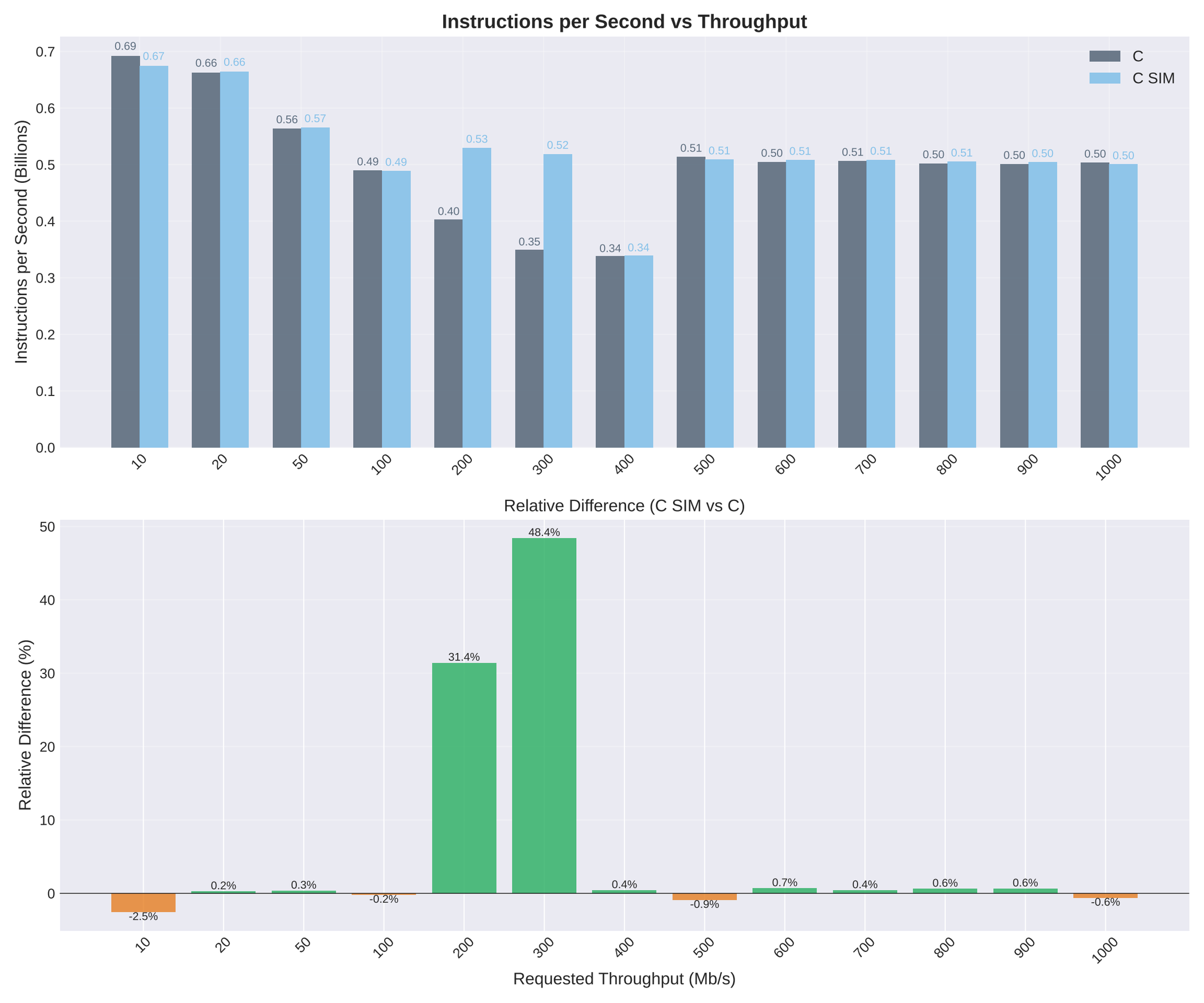
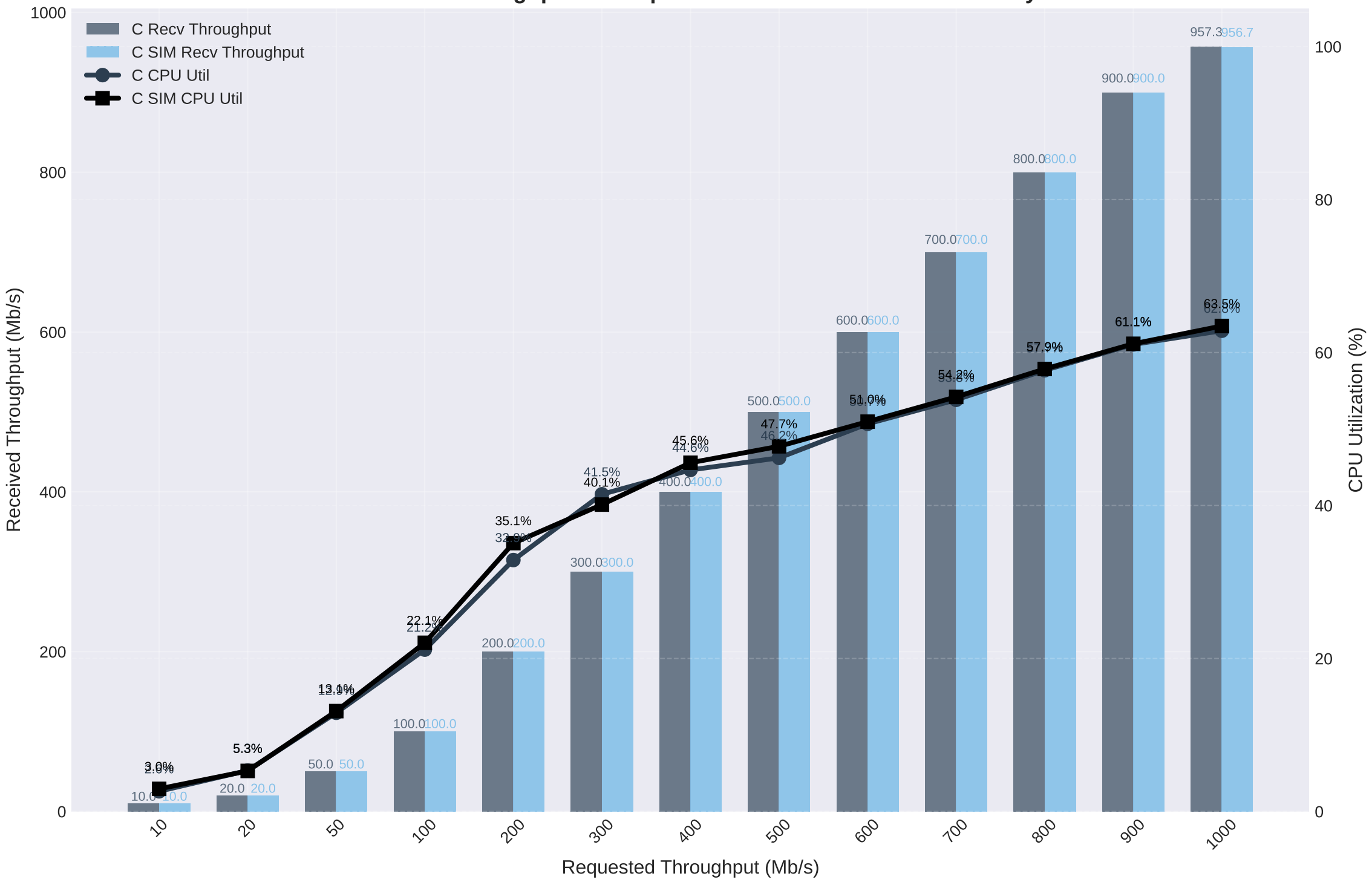
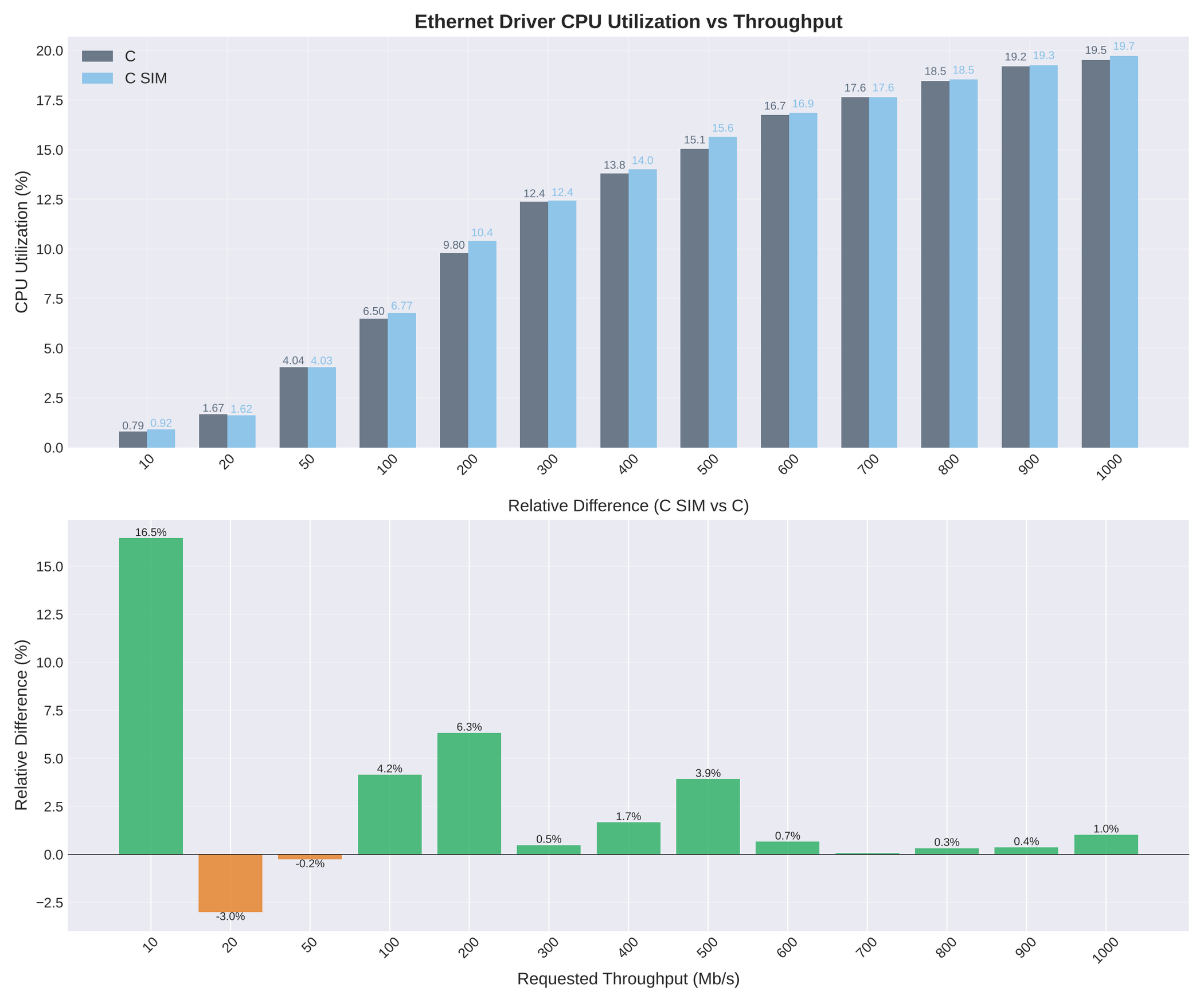

Instructions per Second vs Throughput
Instructions per Second (Billions)
C
C SIM
0.69 0.67
0.66 0.66
0.56 0.57
0.49 0.49
0.40 0.53
0.35 0.52
0.34 0.34
0.51 0.51
0.50 0.51
0.51 0.51
0.50 0.51
0.50 0.50
0.50 0.50
10 20 50 100 200 300 400 500 600 700 800 900 1000
Relative Difference (C SIM vs C)
Relative Difference (%)
-2.5%
0.2%
0.3%
-0.2%
31.4%
48.4%
0.4%
-0.9%
0.7%
0.4%
0.6%
0.6%
-0.6%
Requested Throughput (Mb/s)

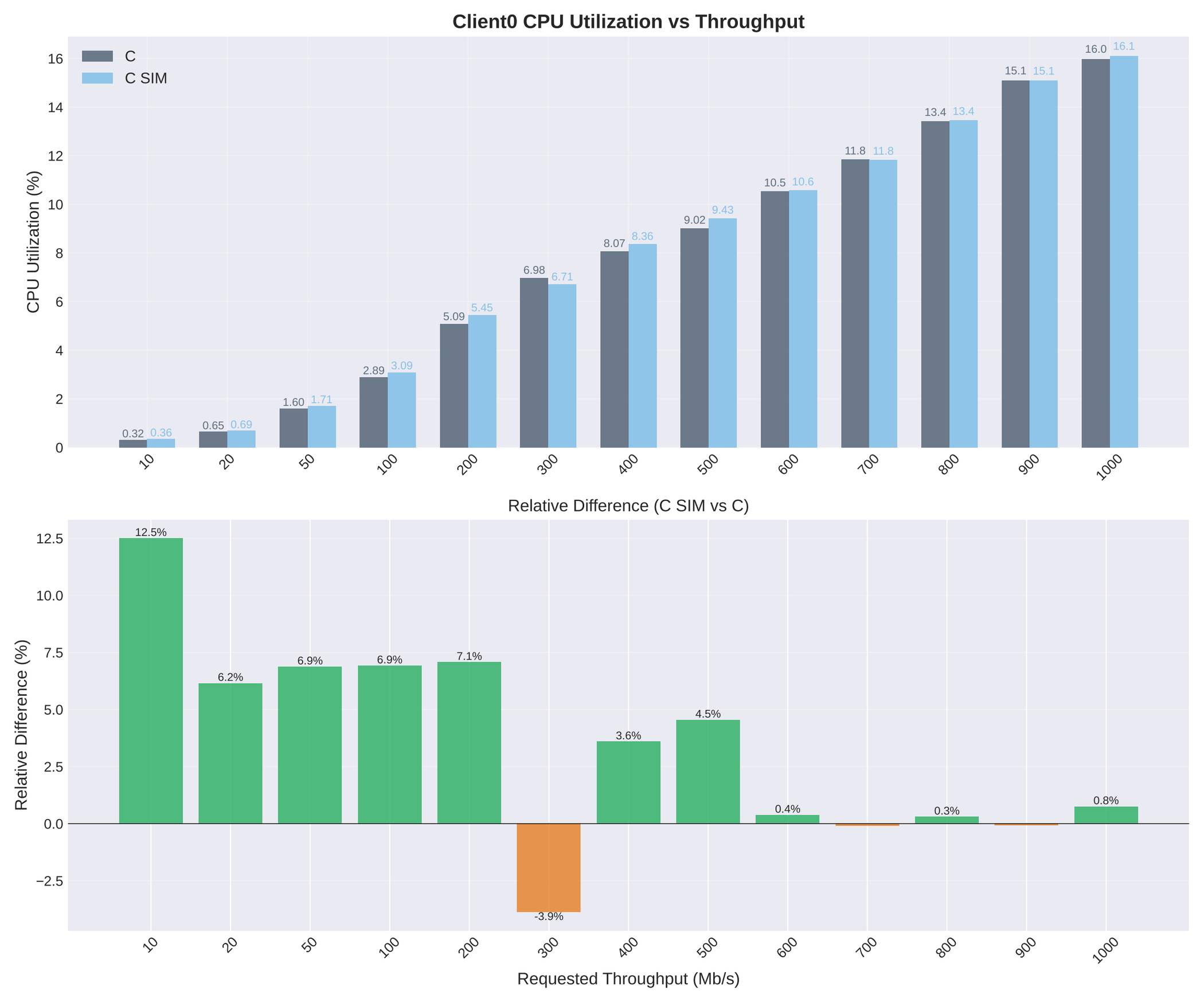

Received Throughput vs Requested with CPU Utilization Overlay
C Recv Throughput
C SIM Recv Throughput
C CPU Util
C SIM CPU Util
Received Throughput (Mb/s)
CPU Utilization (%)
Requested Throughput (Mb/s)
0
200
400
600
800
1000
0
20
40
60
80
100
10
20
50
100
200
300
400
500
600
700
800
900
1000
10.0
20.0
50.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
957.3
956.7
5.3%
22.1%
35.1%
41.5%
40.1%
45.6%
44.6%
47.7%
46.2%
51.0%
54.2%
57.9%
61.1%
63.5%

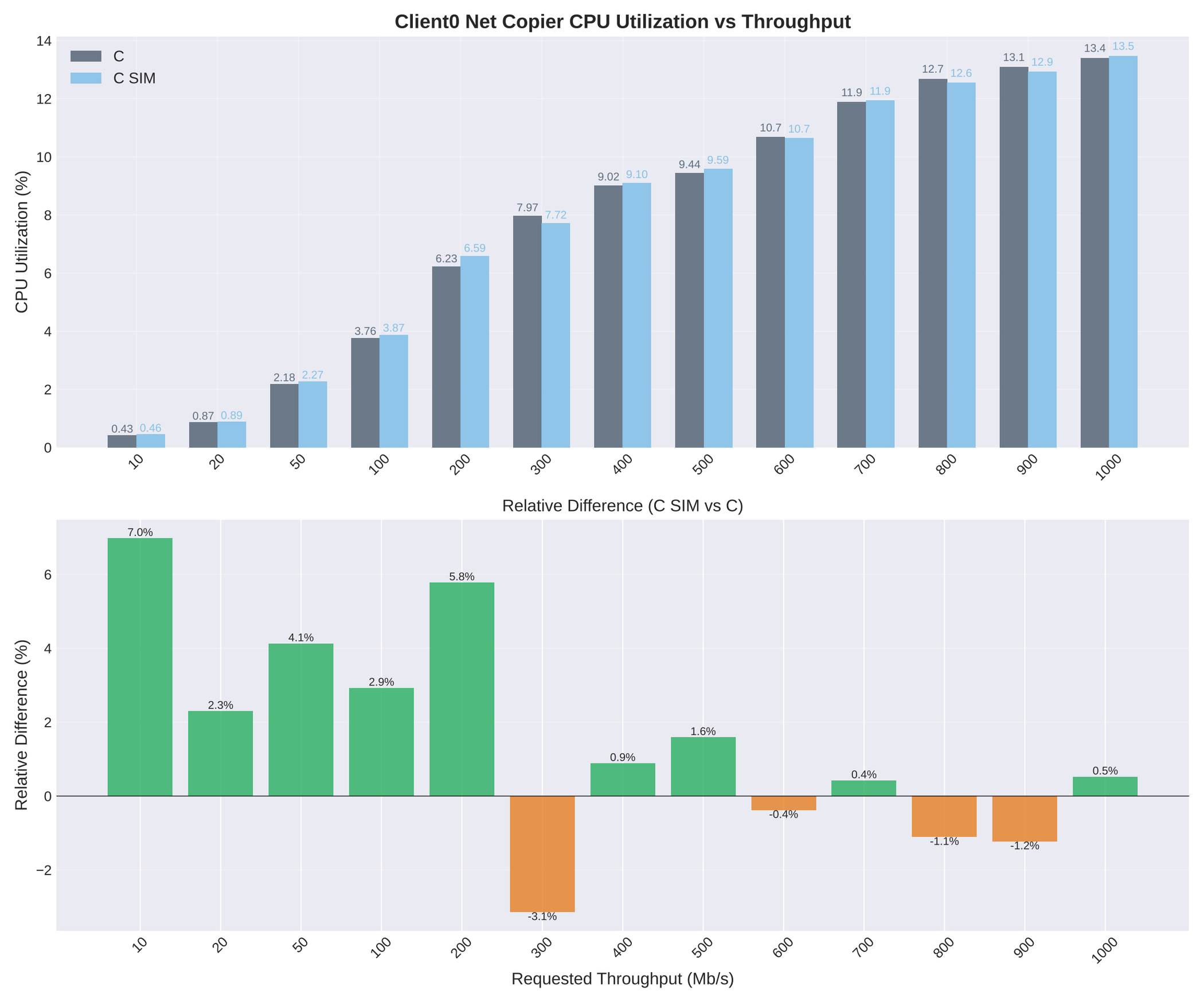
Total System CPU Utilization vs Throughput
C
C SIM
CPU Utilization (%)
0
10
20
30
40
50
60
2.64
2.96
5.35
5.30
12.9
13.1
21.2
22.1
32.9
35.1
41.5
40.1
44.6
45.6
46.2
47.7
50.7
51.0
53.8
54.2
57.7
57.9
61.1
61.1
62.8
63.5
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−4
−2
0
2
4
6
8
10
12
12.1%
-0.9%
1.7%
4.2%
6.7%
-3.3%
2.1%
3.3%
0.6%
0.7%
0.3%
0.1%
1.0%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

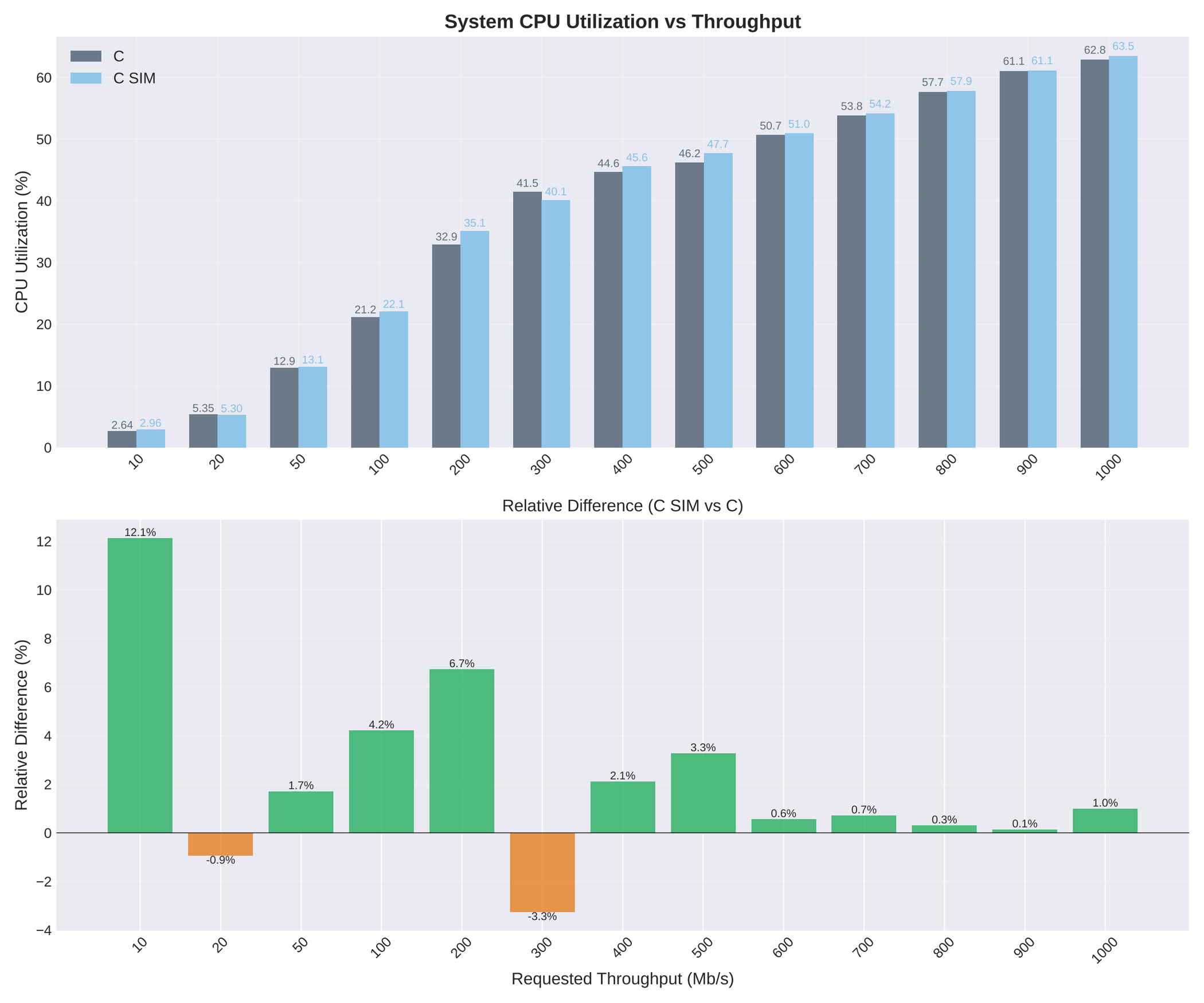

Ethernet Driver CPU Utilization vs Throughput
C
C SIM
CPU Utilization (%)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
0.79
0.92
1.67
1.62
4.04
4.03
6.50
6.77
9.80
10.4
12.4
12.4
13.8
14.0
15.1
15.6
16.7
16.9
17.6
17.6
18.5
18.5
19.2
19.3
19.5
19.7
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−2.5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
16.5%
-3.0%
-0.2%
4.2%
6.3%
0.5%
1.7%
3.9%
0.7%
0.3%
0.4%
1.0%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

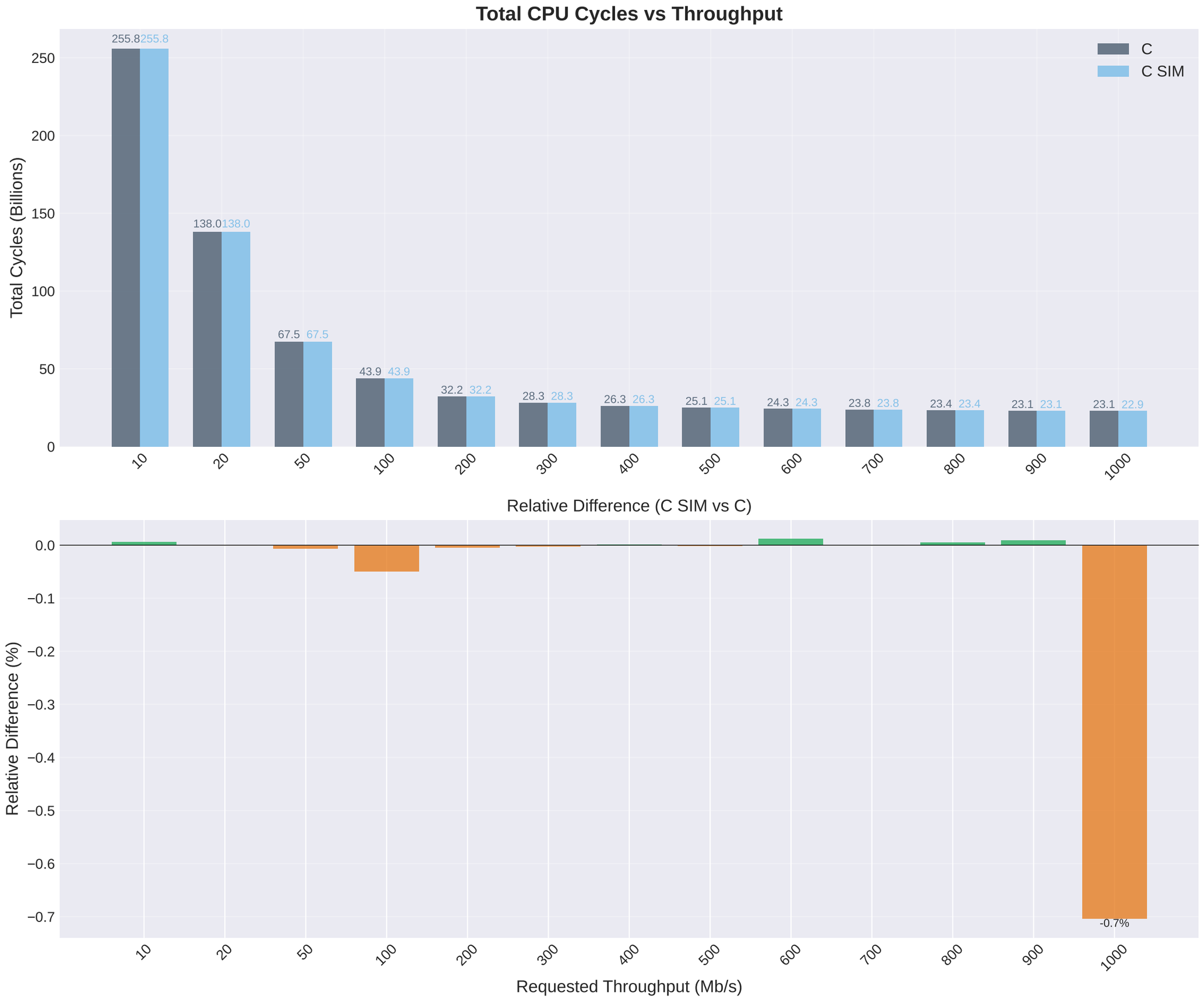
Net Virt TX CPU Utilization vs Throughput
C
C SIM
CPU Utilization (%)
0
1
2
3
4
5
6
0.31
0.38
0.68
0.65
1.65
1.65
2.56
2.68
3.62
4.00
4.42
4.14
4.17
4.34
4.22
4.12
4.57
4.66
4.74
4.84
5.35
5.46
6.18
6.27
6.56
6.66
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−5
0
5
10
15
20
22.6%
-4.4%
4.7%
10.5%
-6.3%
4.1%
-2.4%
2.0%
2.1%
2.1%
1.5%
1.5%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

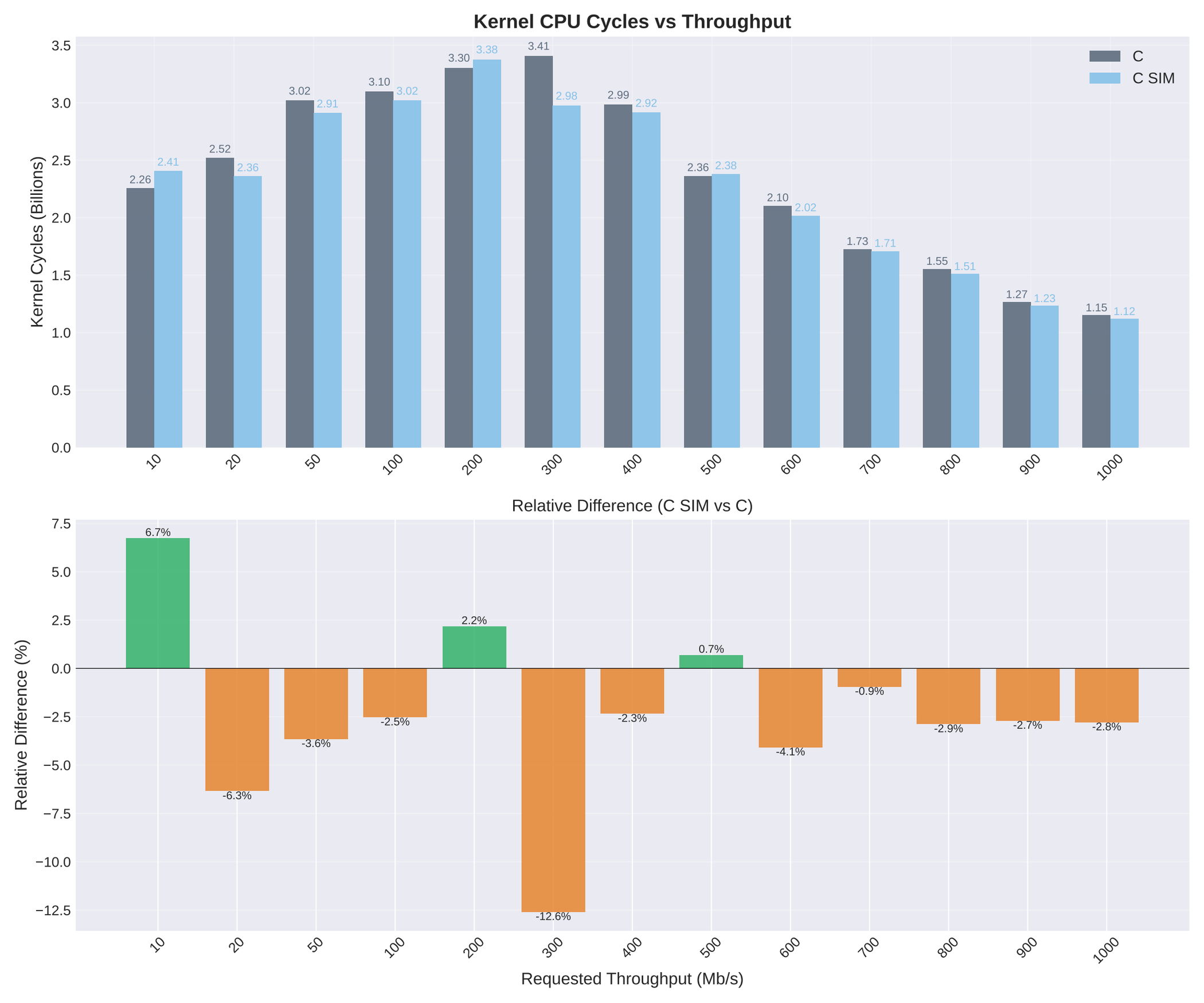
Net Virt RX CPU Utilization vs Throughput
CPU Utilization (%)
C
C SIM
0.48
0.52
0.96
1.03
2.41
2.59
4.07
4.28
6.64
7.07
8.17
7.77
8.64
8.96
8.01
8.50
7.71
7.77
7.23
7.46
7.25
7.36
6.99
7.07
6.86
6.97
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
8.3%
7.3%
7.5%
5.2%
6.5%
-4.9%
3.7%
6.1%
0.8%
3.2%
1.5%
1.1%
1.6%
Requested Throughput (Mb/s)

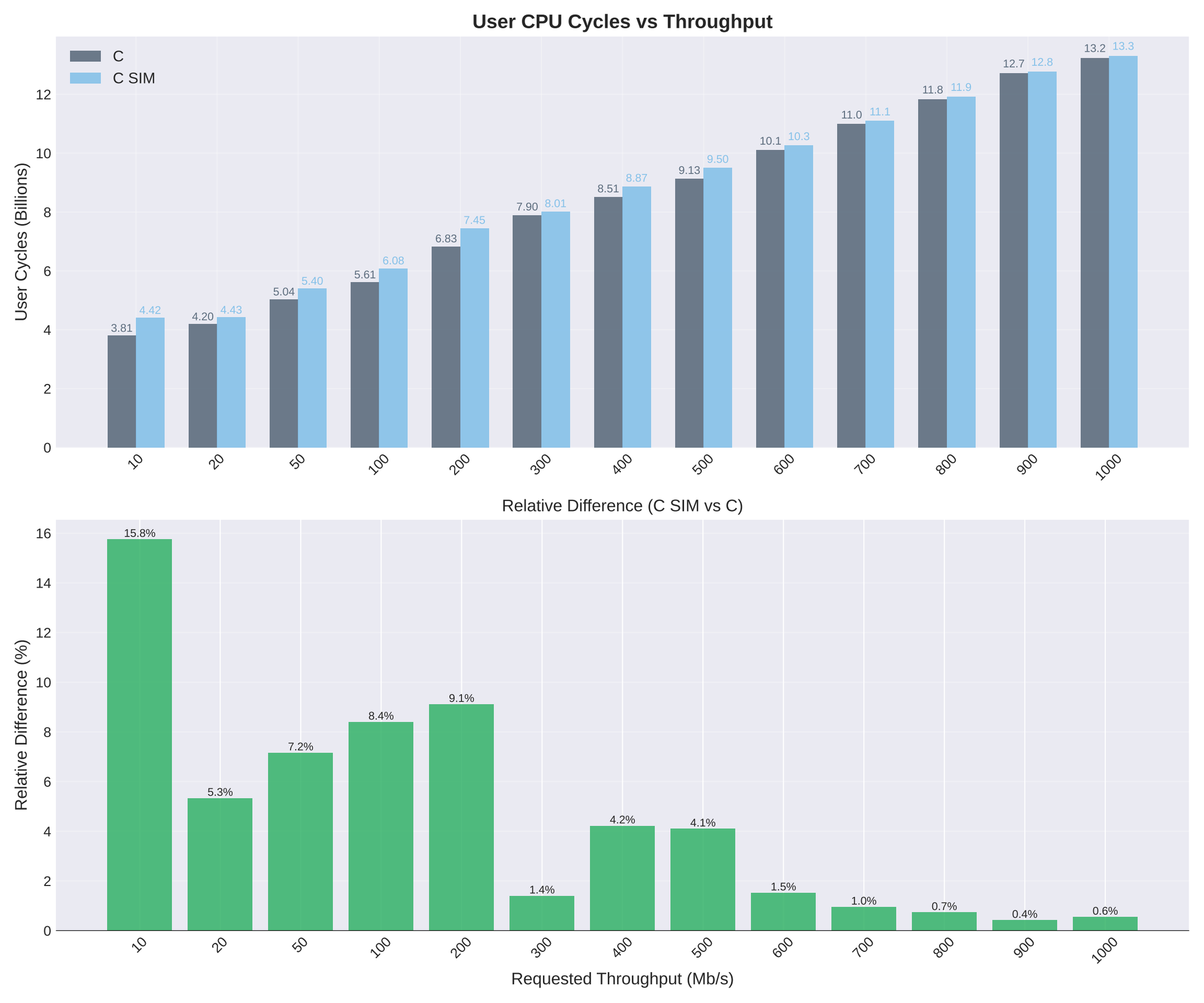

Client0 CPU Utilization vs Throughput
C
C SIM
CPU Utilization (%)
0
2
4
6
8
10
12
14
16
0.32
0.36
0.65
0.69
1.60
1.71
2.89
3.09
5.09
5.45
6.98
6.71
8.07
8.36
9.02
9.43
10.5
10.6
11.8
11.8
13.4
13.4
15.1
15.1
16.0
16.1
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−2.5
0.0
2.5
5.0
7.5
10.0
12.5
12.5%
6.2%
6.9%
6.9%
7.1%
-3.9%
3.6%
4.5%
0.4%
0.3%
0.8%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)


Client0 Net Copier CPU Utilization vs Throughput
C
C SIM
CPU Utilization (%)
0
2
4
6
8
10
12
14
0.43
0.46
0.87
0.89
2.18
2.27
3.76
3.87
6.23
6.59
7.97
7.72
9.02
9.10
9.44
9.59
10.7
10.7
11.9
11.9
12.7
12.6
13.1
12.9
13.4
13.5
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−2
0
2
4
6
7.0%
2.3%
4.1%
2.9%
5.8%
-3.1%
0.9%
1.6%
-0.4%
0.4%
-1.1%
-1.2%
0.5%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

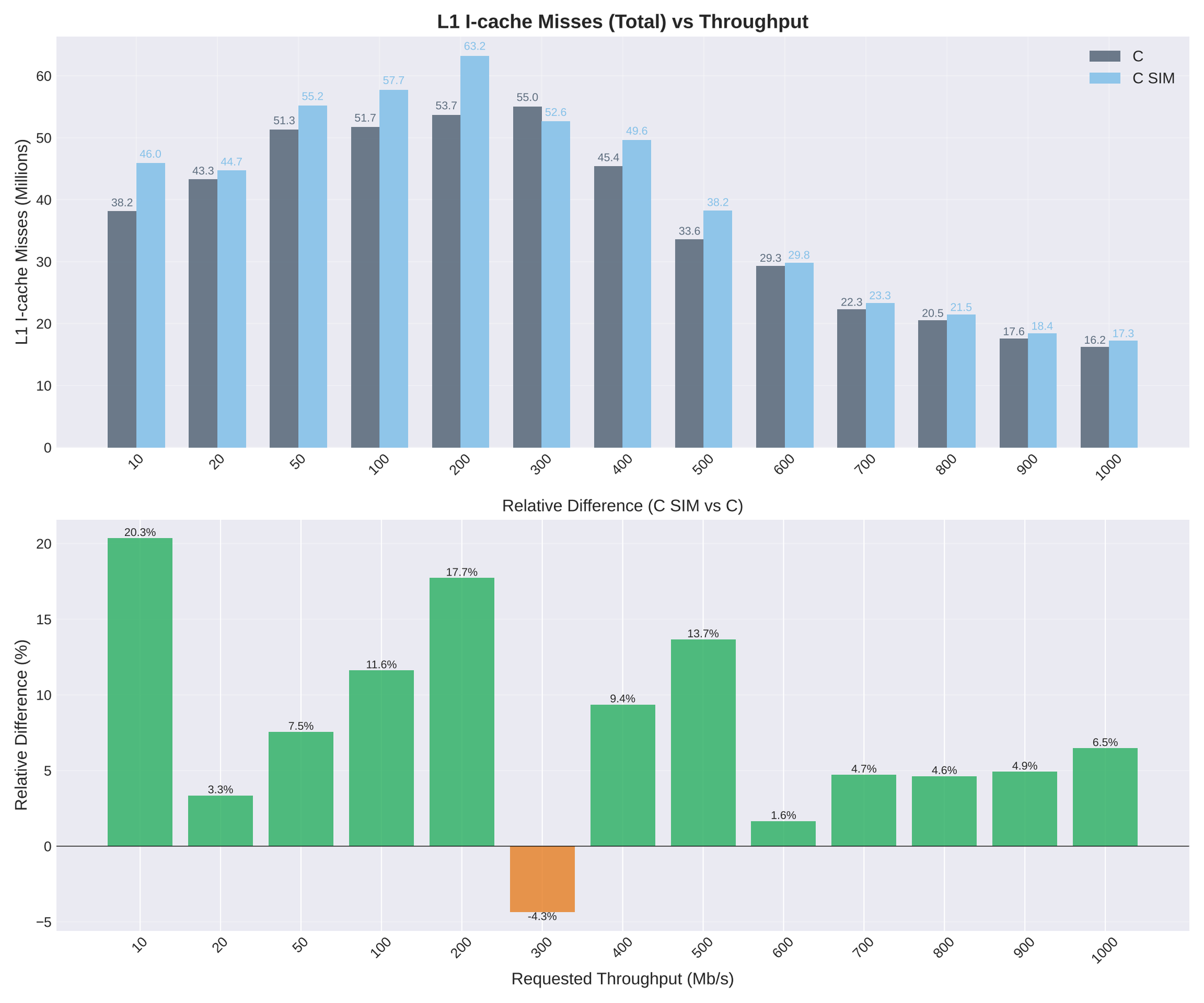

System CPU Utilization vs Throughput
C
C SIM
CPU Utilization (%)
0
10
20
30
40
50
60
2.64
2.96
5.35
5.30
12.9
13.1
21.2
22.1
32.9
35.1
41.5
40.1
44.6
45.6
46.2
47.7
50.7
51.0
53.8
54.2
57.7
57.9
61.1
61.1
62.8
63.5
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−4
−2
0
2
4
6
8
10
12
12.1%
-0.9%
1.7%
4.2%
6.7%
-3.3%
2.1%
3.3%
0.6%
0.7%
0.3%
0.1%
1.0%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

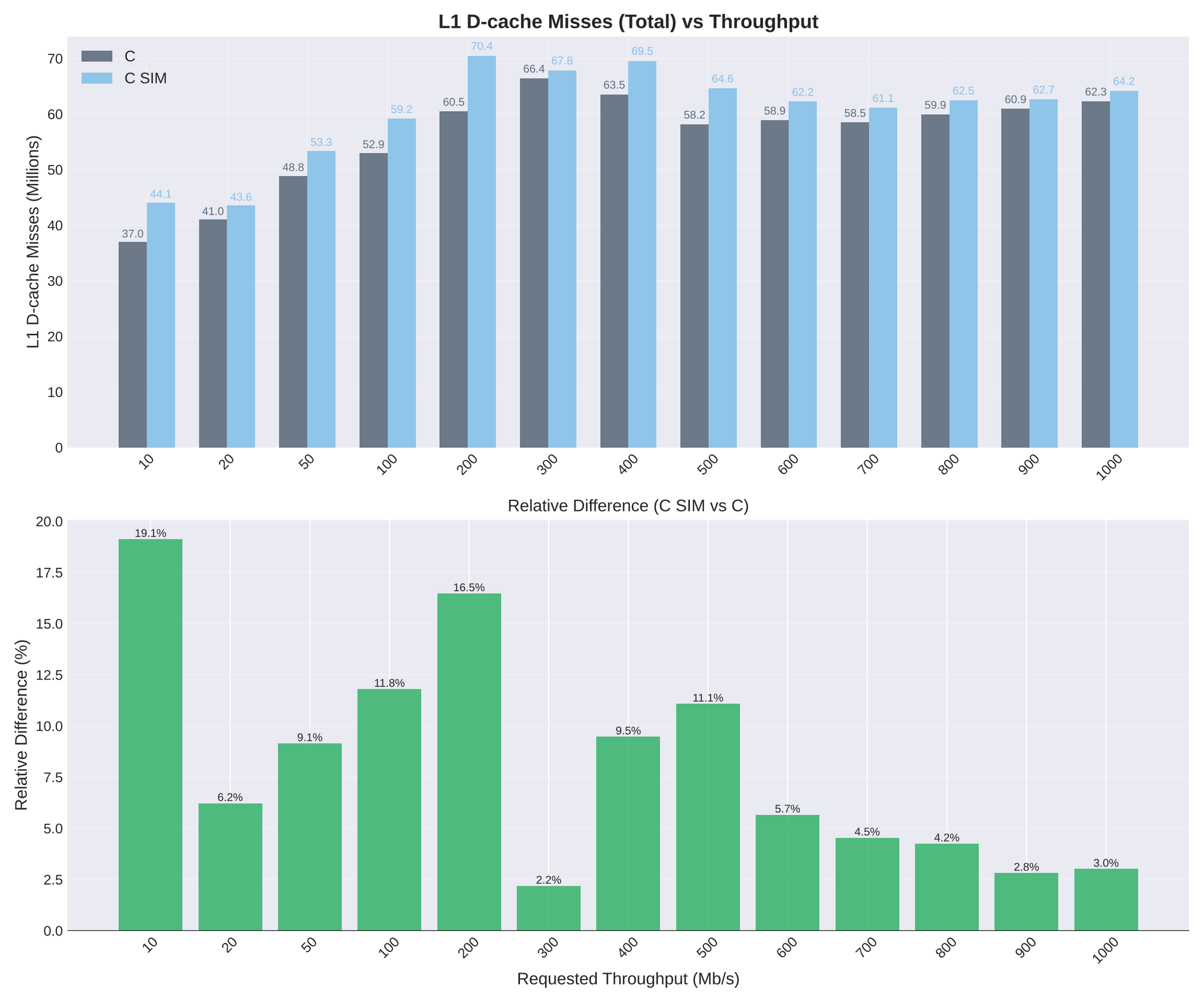

Total CPU Cycles vs Throughput
C
C SIM
Total Cycles (Billions)
0
50
100
150
200
250
255.8 255.8
138.0 138.0
67.5 67.5
43.9 43.9
32.2 32.2
28.3 28.3
26.3 26.3
25.1 25.1
24.3 24.3
23.8 23.8
23.4 23.4
23.1 23.1
23.1 22.9
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
-0.7%
Requested Throughput (Mb/s)

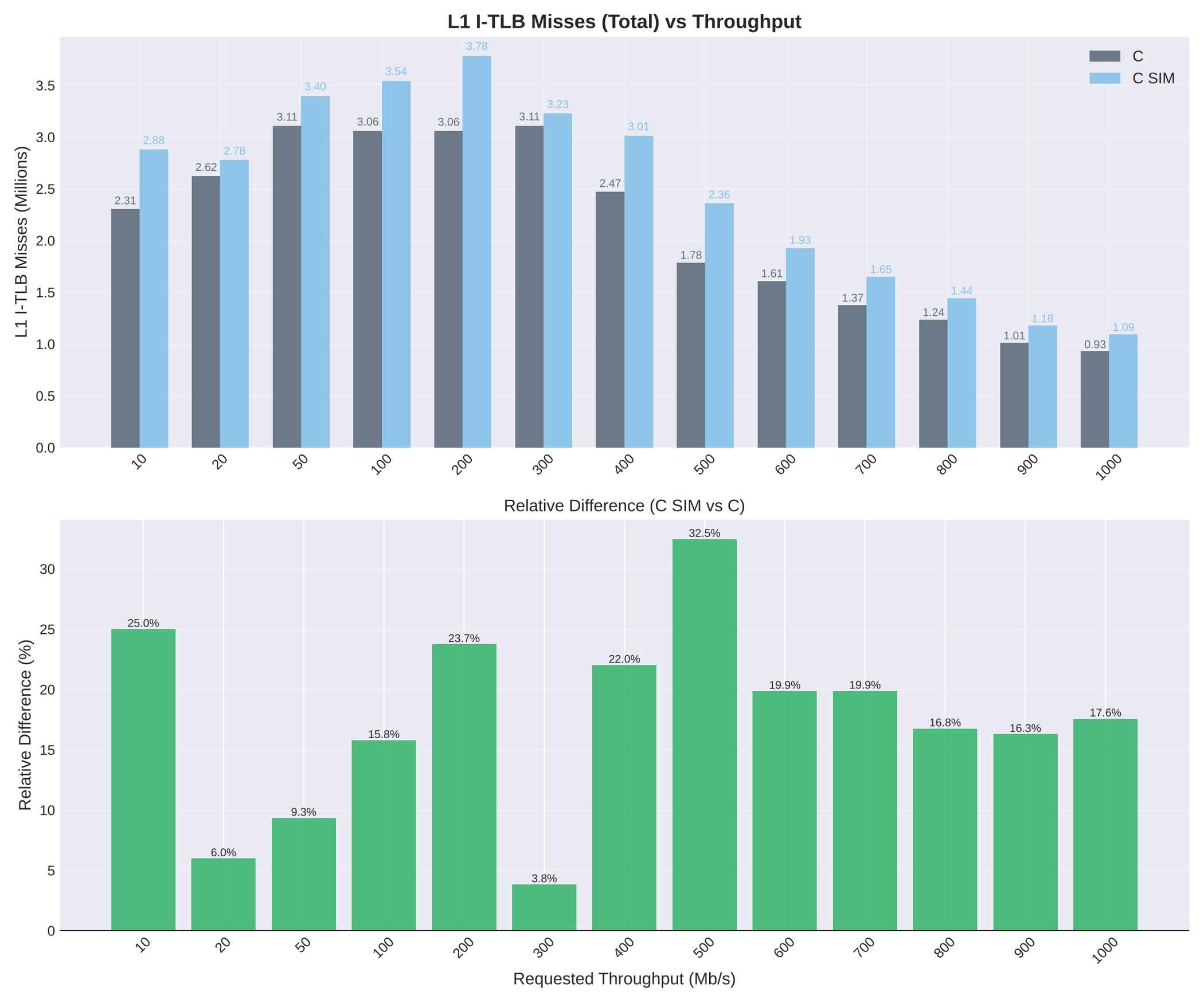

Kernel CPU Cycles vs Throughput
Kernel Cycles (Billions)
C
C SIM
2.26
2.41
2.52
2.36
3.02
2.91
3.10
3.02
3.30
3.38
3.41
2.98
2.99
2.92
2.36
2.38
2.10
2.02
1.73
1.71
1.55
1.51
1.27
1.23
1.15
1.12
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
6.7%
-6.3%
-3.6%
-2.5%
2.2%
-12.6%
-2.3%
0.7%
-4.1%
-0.9%
-2.9%
-2.7%
-2.8%
Requested Throughput (Mb/s)

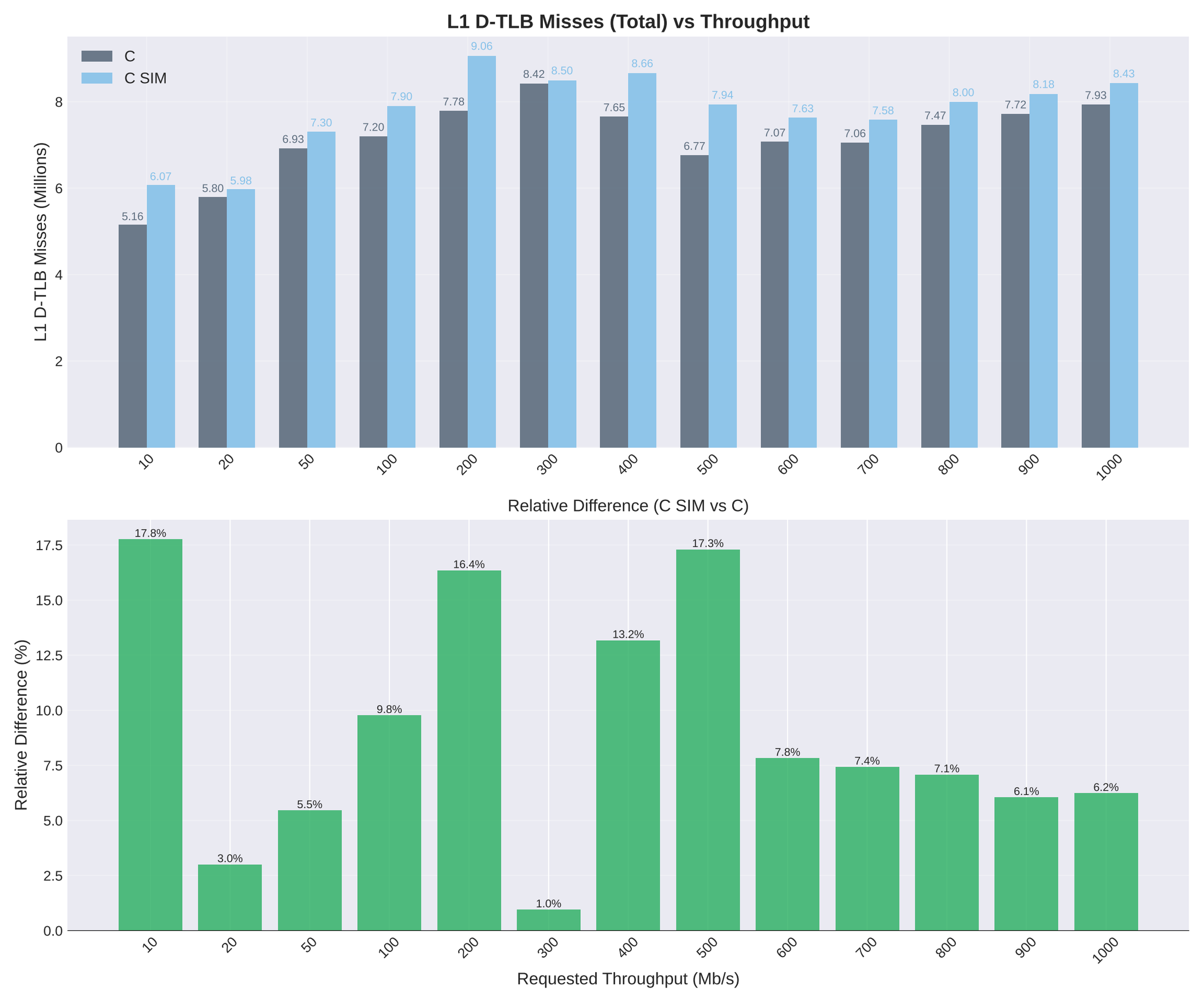

User CPU Cycles vs Throughput
C
C SIM
User Cycles (Billions)
0
2
4
6
8
10
12
3.81
4.42
4.20
4.43
5.04
5.40
5.61
6.08
6.83
7.45
7.90
8.01
8.51
8.87
9.13
9.50
10.1
10.3
11.0
11.1
11.8
11.9
12.7
12.8
13.2
13.3
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0
2
4
6
8
10
12
14
16
15.8%
5.3%
7.2%
8.4%
9.1%
1.4%
4.2%
4.1%
1.5%
1.0%
0.7%
0.4%
0.6%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

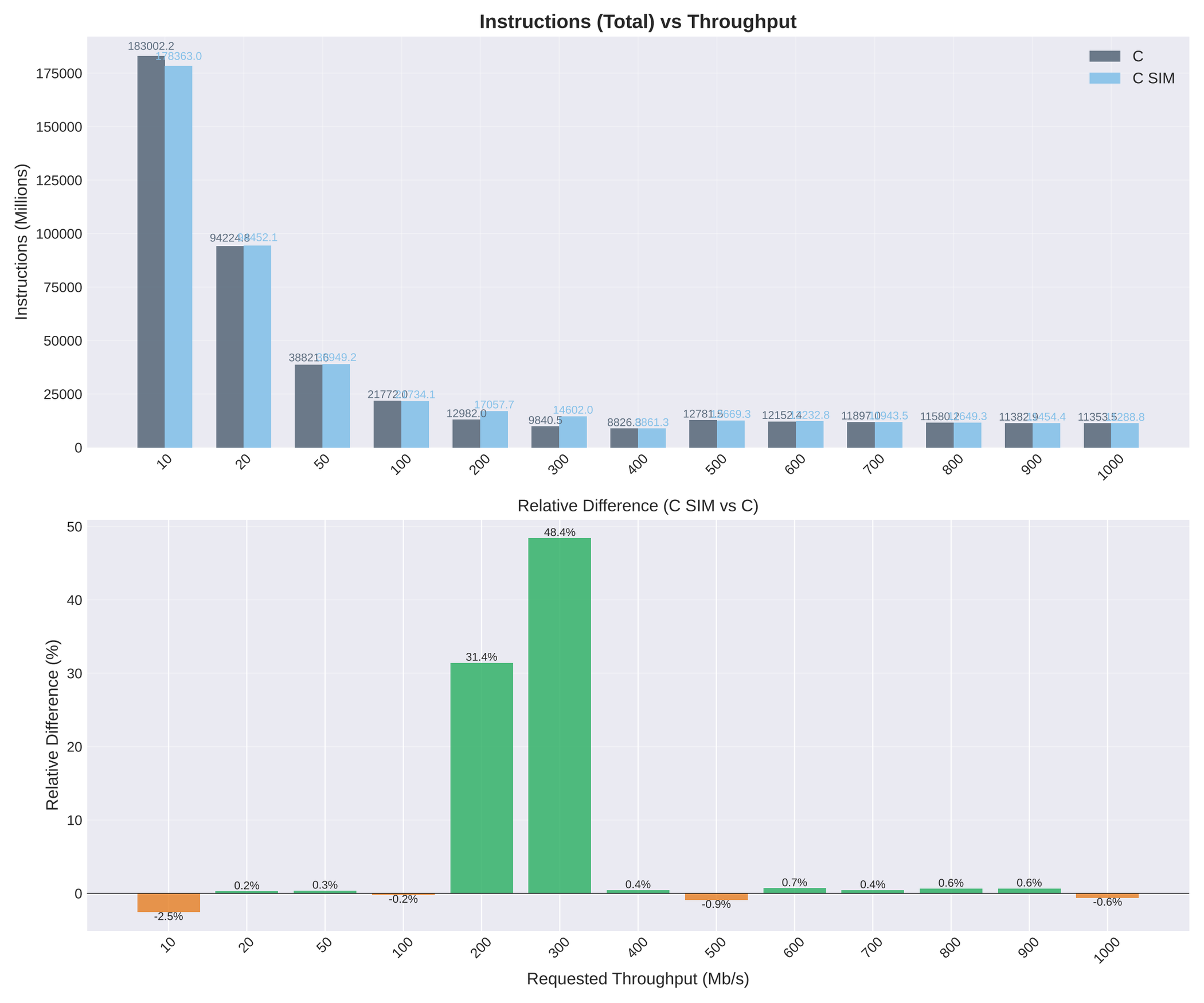
Idle CPU Cycles vs Throughput
Idle Cycles (Billions)
C
C SIM
249.0 248.2
130.6 130.7
58.8 58.7
34.6 34.2
21.6 20.9
16.6 16.9
14.5 14.3
13.5 13.1
12.0 11.9
11.0 10.9
9.90 9.86
8.98 8.96
8.57 8.36
Relative Difference (C SIM vs C)
Relative Difference (%)
-0.3%
-0.3%
-1.2%
-3.3%
2.3%
-1.7%
-2.8%
-0.6%
-0.8%
-0.4%
-0.2%
-2.4%
Requested Throughput (Mb/s)

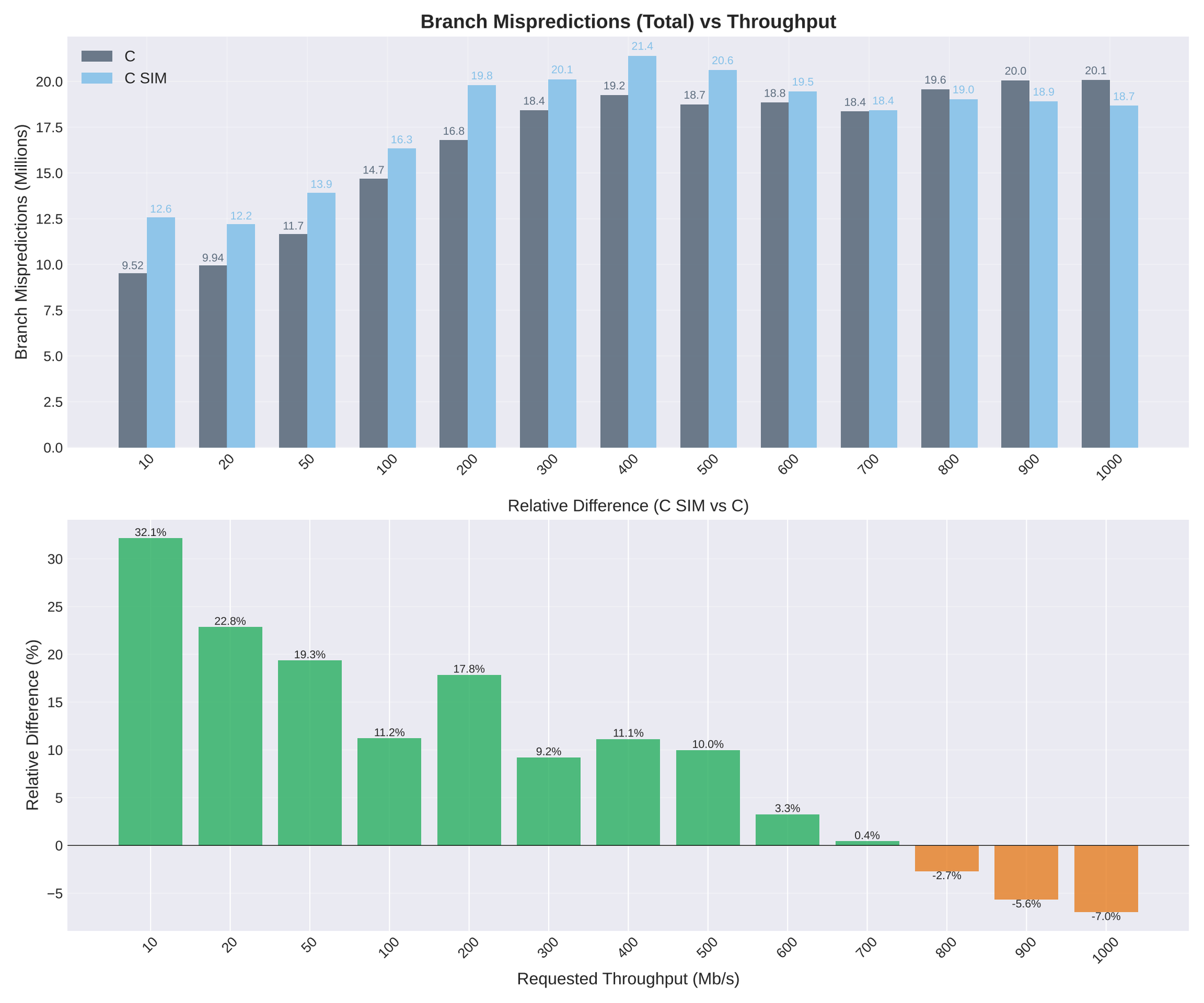

L1 I-cache Misses (Total) vs Throughput
C
C SIM
L1 I-cache Misses (Millions)
0
10
20
30
40
50
60
38.2
46.0
43.3
44.7
51.3
55.2
51.7
57.7
53.7
63.2
55.0
52.6
45.4
49.6
33.6
38.2
29.3
29.8
22.3
23.3
20.5
21.5
17.6
18.4
16.2
17.3
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−5
0
5
10
15
20
20.3%
3.3%
7.5%
11.6%
17.7%
-4.3%
9.4%
13.7%
1.6%
4.7%
4.6%
4.9%
6.5%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

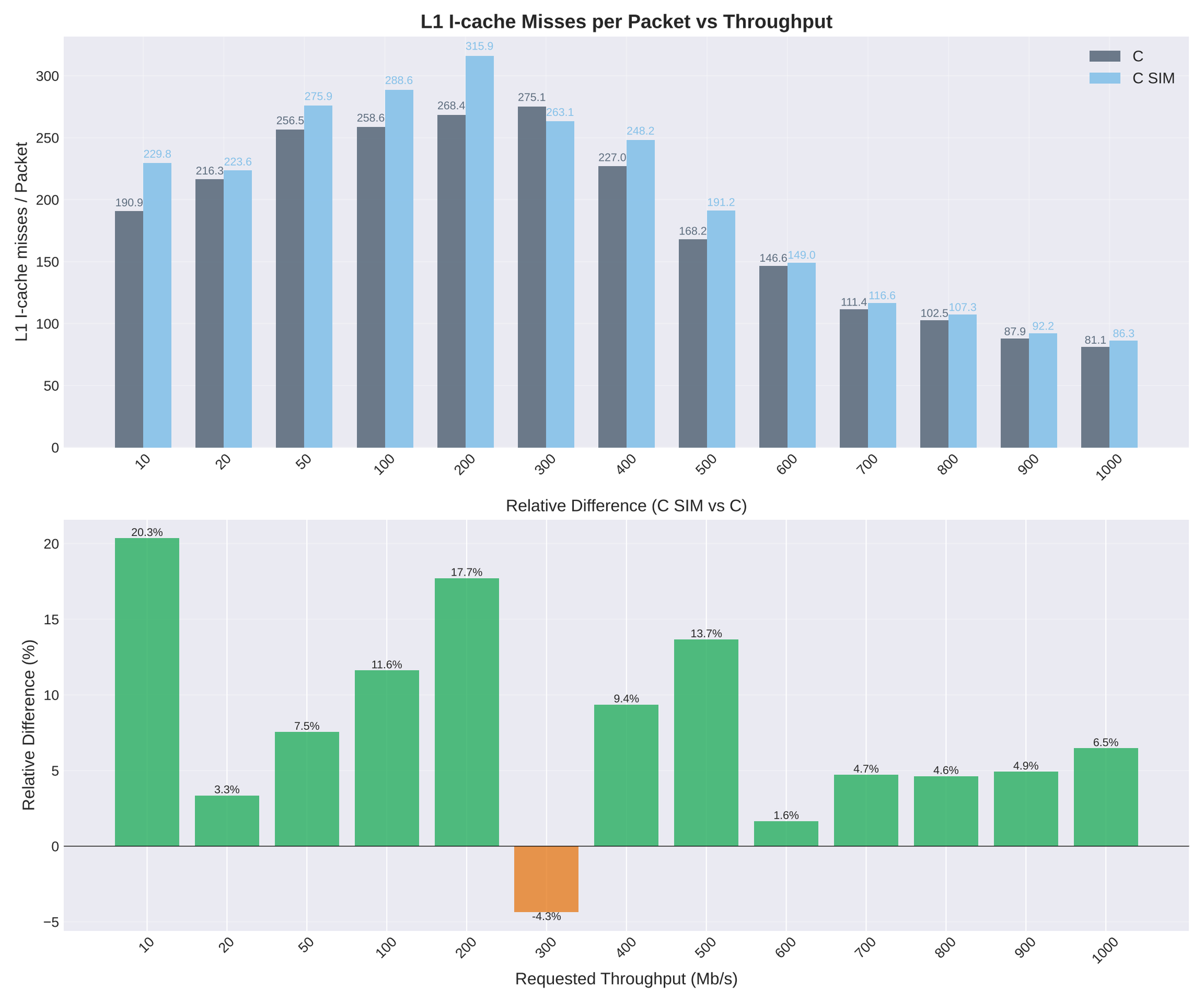

L1 D-cache Misses (Total) vs Throughput
C
C SIM
L1 D-cache Misses (Millions)
0
10
20
30
40
50
60
70
37.0
44.1
41.0
43.6
48.8
53.3
52.9
59.2
60.5
70.4
66.4
67.8
63.5
69.5
58.2
64.6
58.9
62.2
58.5
61.1
59.9
62.5
60.9
62.7
62.3
64.2
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
19.1%
6.2%
9.1%
11.8%
16.5%
2.2%
9.5%
11.1%
5.7%
4.5%
4.2%
2.8%
3.0%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

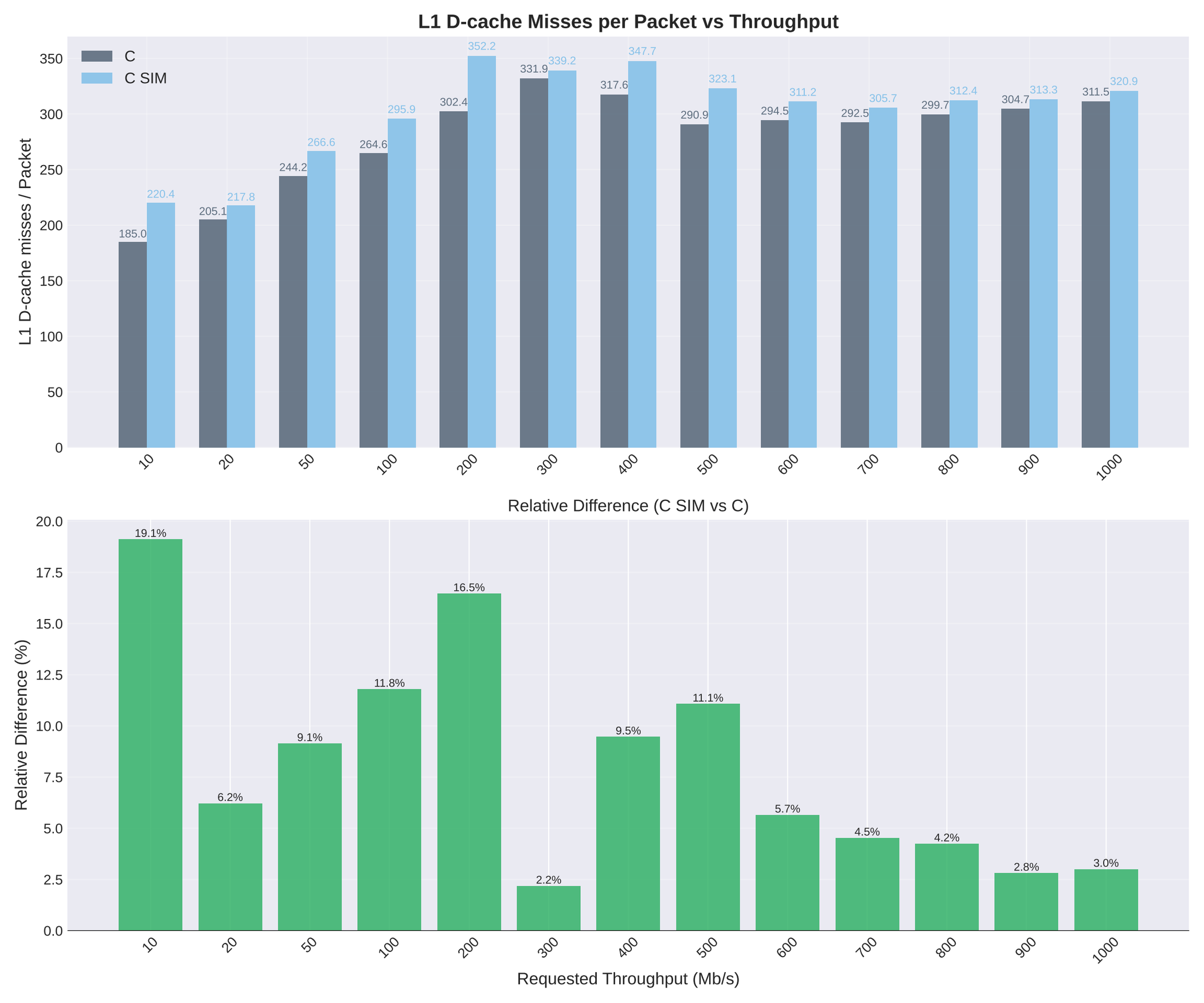

L1 I-TLB Misses (Total) vs Throughput
L1 I-TLB Misses (Millions)
C
C SIM
2.31
2.88
2.62
2.78
3.11
3.40
3.06
3.54
3.06
3.78
3.11
3.23
2.47
3.01
1.78
2.36
1.61
1.93
1.37
1.65
1.24
1.44
1.01
1.18
0.93
1.09
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
25.0%
6.0%
9.3%
15.8%
23.7%
3.8%
22.0%
32.5%
19.9%
19.9%
16.8%
16.3%
17.6%
Requested Throughput (Mb/s)

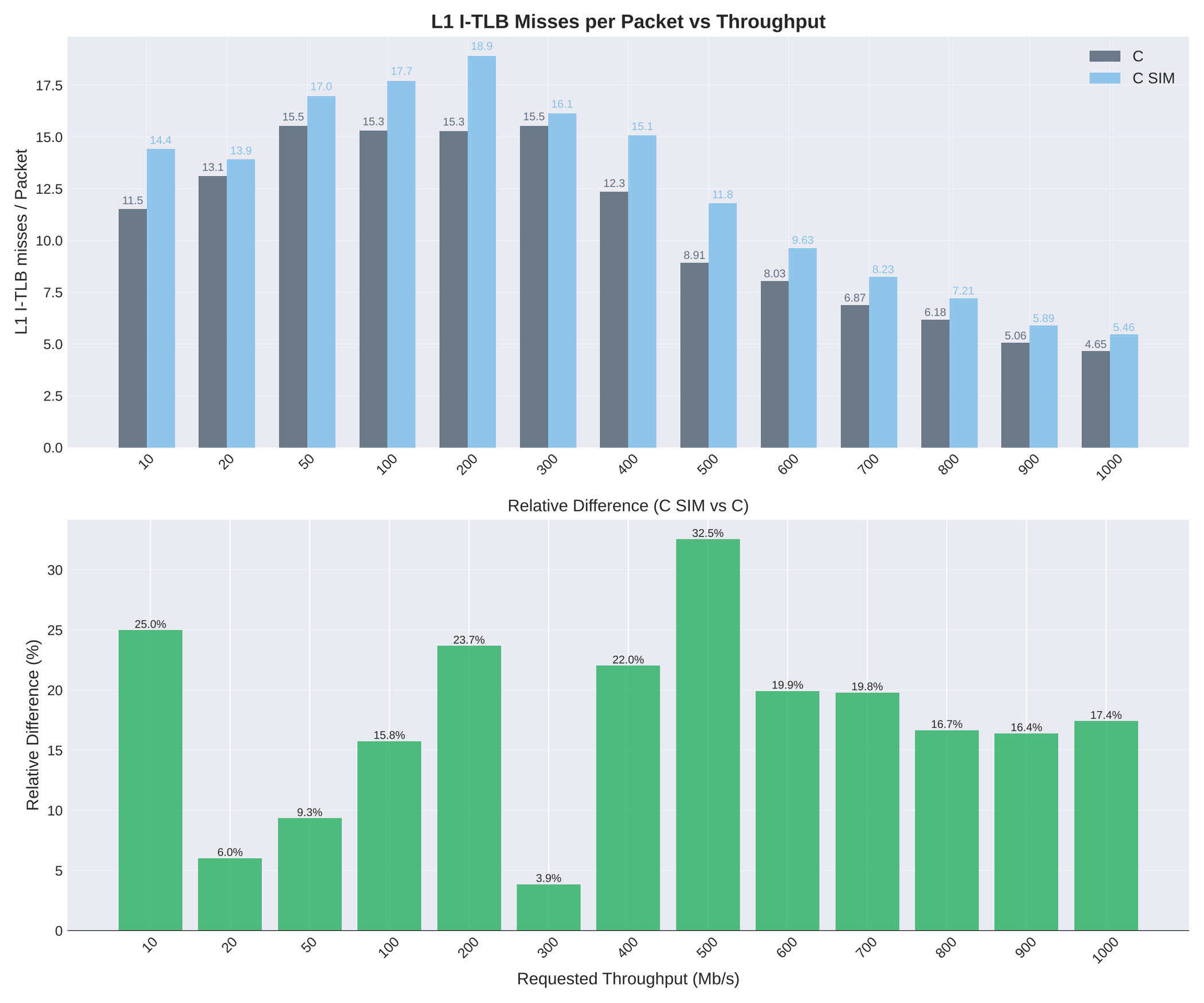

L1 D-TLB Misses (Total) vs Throughput
C
C SIM
L1 D-TLB Misses (Millions)
0
2
4
6
8
5.16
6.07
5.80
5.98
6.93
7.30
7.20
7.90
7.78
9.06
8.42
8.50
7.65
8.66
6.77
7.94
7.07
7.63
7.06
7.58
7.47
8.00
7.72
8.18
7.93
8.43
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
17.8%
3.0%
5.5%
9.8%
16.4%
1.0%
13.2%
17.3%
7.8%
7.4%
7.1%
6.1%
6.2%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

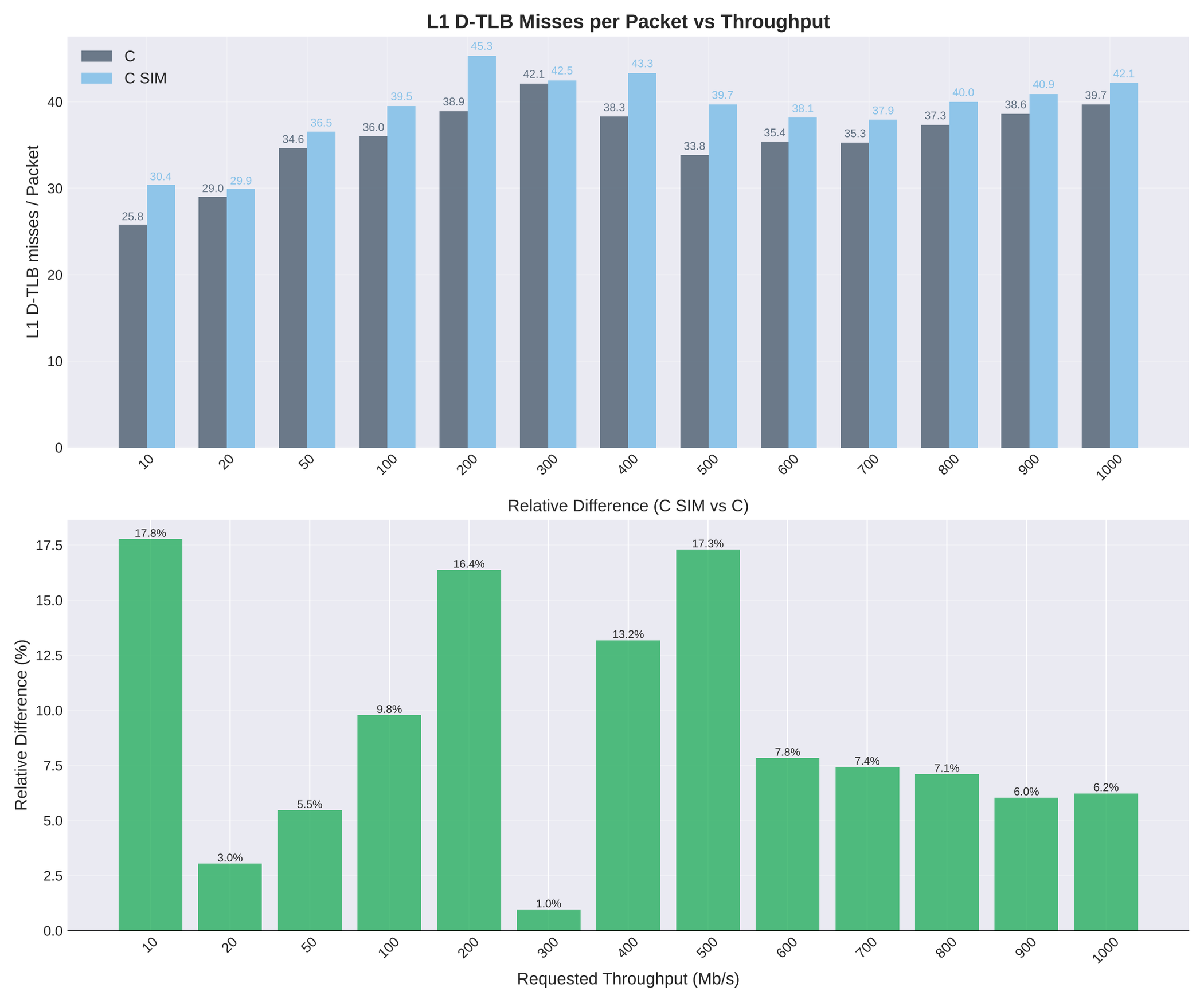

Instructions (Total) vs Throughput
C
C SIM
Instructions (Millions)
183002.2
178363.0
94224.8
38821.6
21772.0
12982.0
9840.5
8826.3
12781.5
12152.4
11897.0
11580.2
11382.9
11353.5
16949.2
20734.1
17057.7
14602.0
Relative Difference (C SIM vs C)
Relative Difference (%)
-2.5%
0.2%
0.3%
-0.2%
31.4%
48.4%
0.4%
-0.9%
0.7%
0.4%
0.6%
0.6%
-0.6%
Requested Throughput (Mb/s)

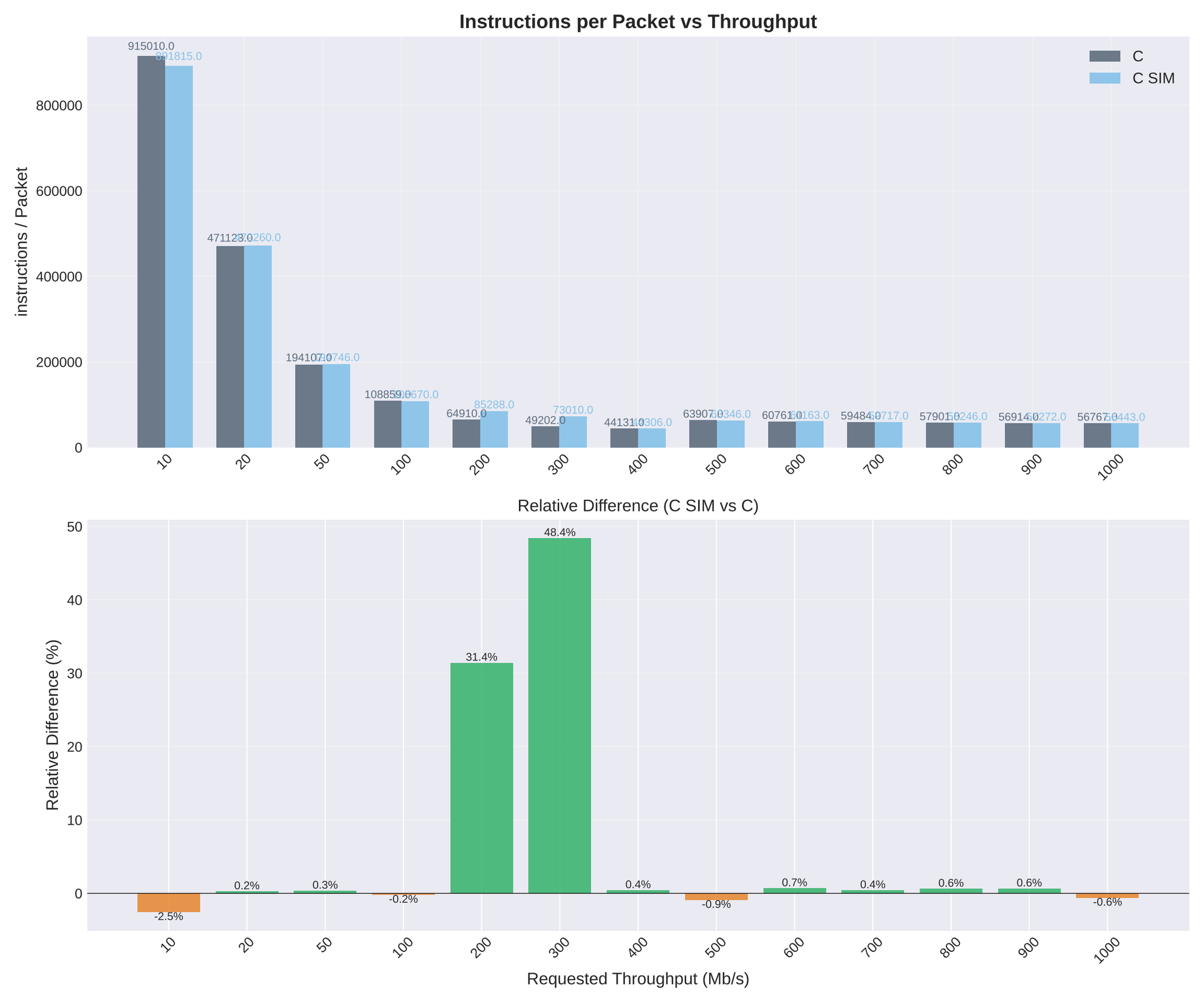

Branch Mispredictions (Total) vs Throughput
C
C SIM
Branch Mispredictions (Millions)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
9.52
12.6
9.94
12.2
11.7
13.9
14.7
16.3
16.8
19.8
18.4
20.1
19.2
21.4
18.7
20.6
18.8
19.5
18.4
18.4
19.6
19.0
20.0
18.9
20.1
18.7
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−5
0
5
10
15
20
25
30
32.1%
22.8%
19.3%
11.2%
17.8%
9.2%
11.1%
10.0%
3.3%
0.4%
-2.7%
-5.6%
-7.0%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

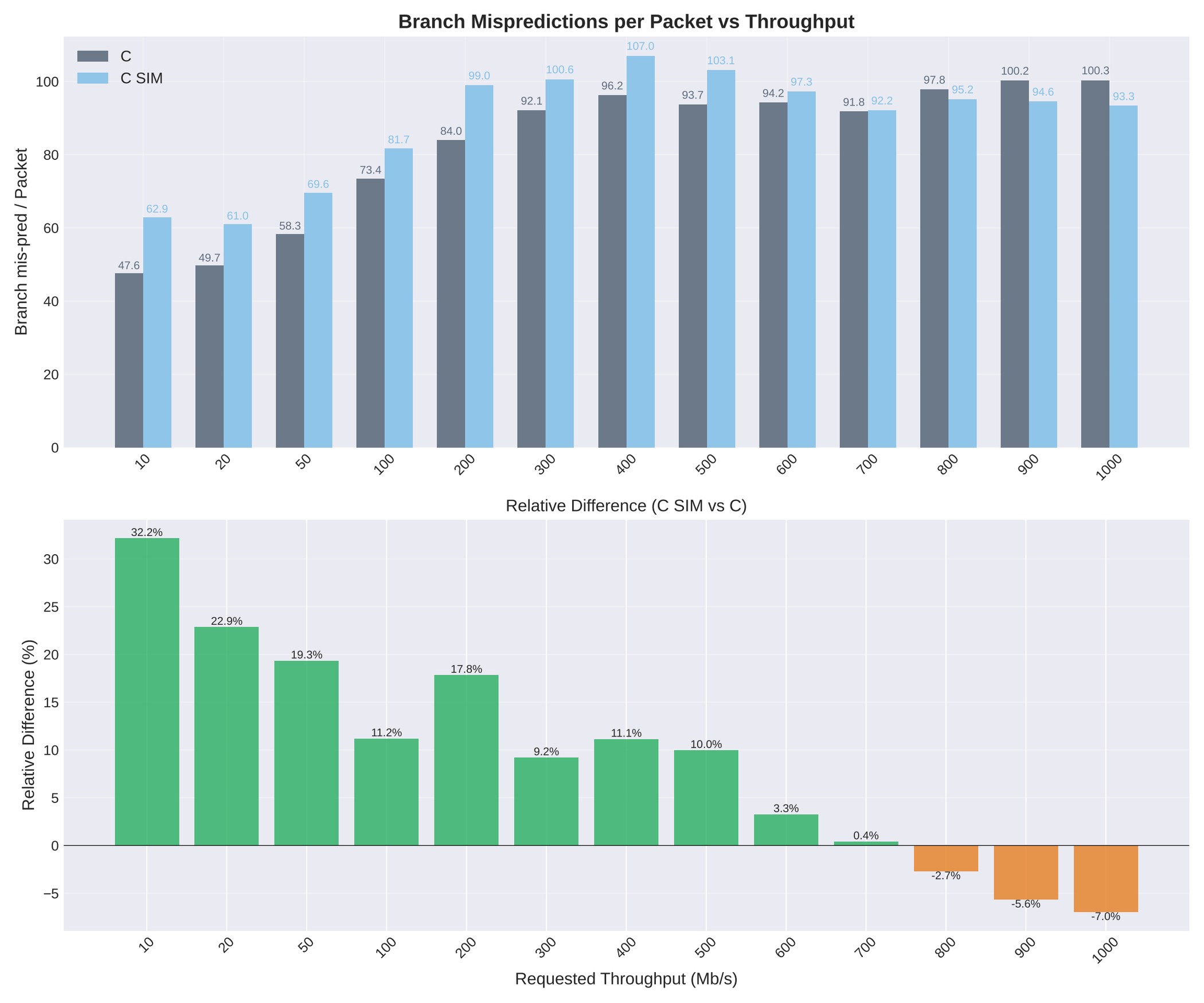

L1 I-cache Misses per Packet vs Throughput
L1 I-cache misses / Packet
C
C SIM
190.9
229.8
216.3
223.6
256.5
275.9
258.6
288.6
268.4
315.9
275.1
263.1
227.0
248.2
168.2
191.2
146.6
149.0
111.4
116.6
102.5
107.3
87.9
92.2
81.1
86.3
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
20.3%
3.3%
7.5%
11.6%
17.7%
-4.3%
9.4%
13.7%
1.6%
4.7%
4.6%
4.9%
6.5%
Requested Throughput (Mb/s)

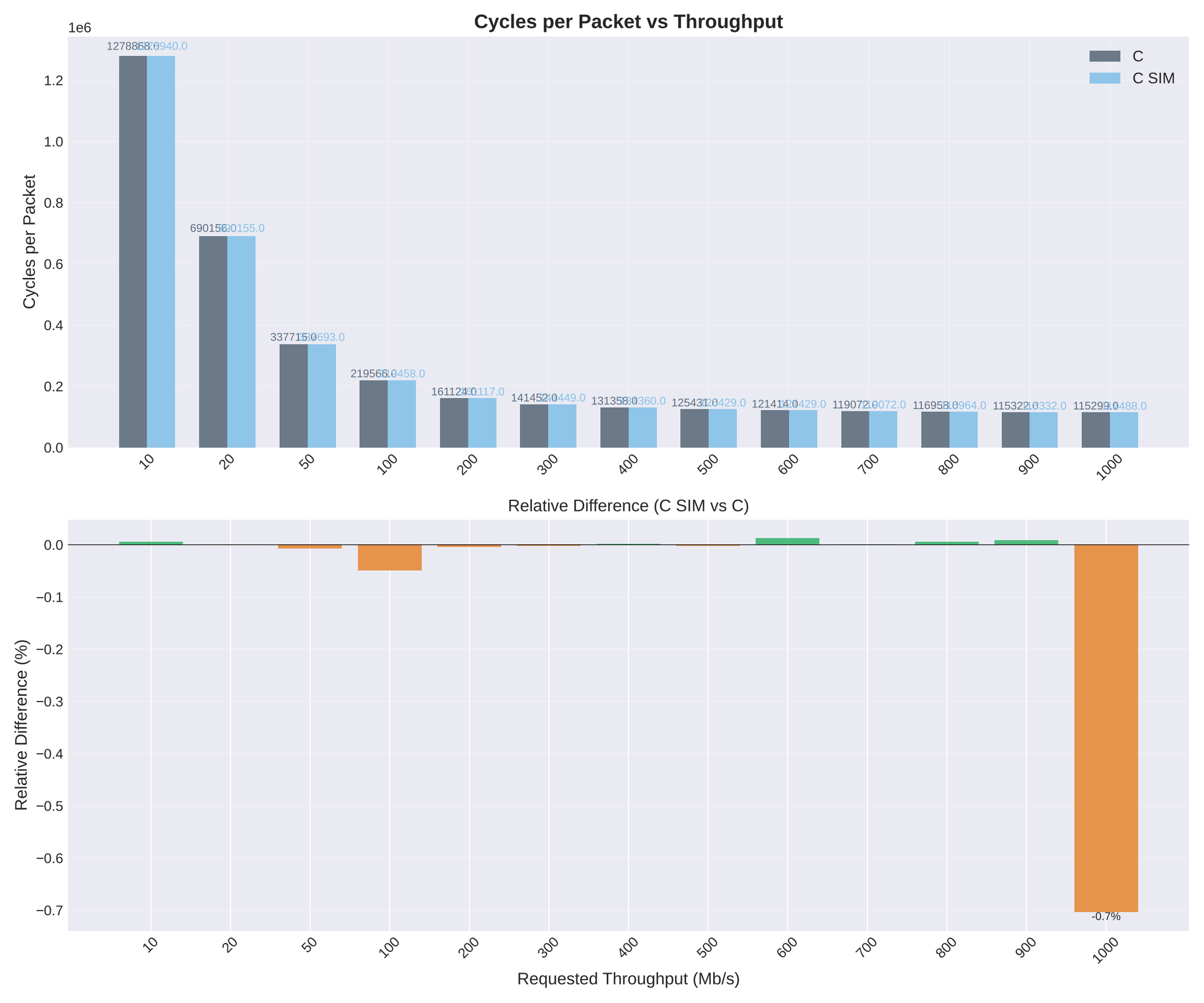

L1 D-cache Misses per Packet vs Throughput
C
C SIM
L1 D-cache misses / Packet
0
50
100
150
200
250
300
350
185.0
220.4
205.1
217.8
244.2
266.6
264.6
295.9
302.4
352.2
331.9
339.2
317.6
347.7
290.9
323.1
294.5
311.2
292.5
305.7
299.7
312.4
304.7
313.3
311.5
320.9
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
19.1%
6.2%
9.1%
11.8%
16.5%
2.2%
9.5%
11.1%
5.7%
4.5%
4.2%
2.8%
3.0%
Requested Throughput (Mb/s)

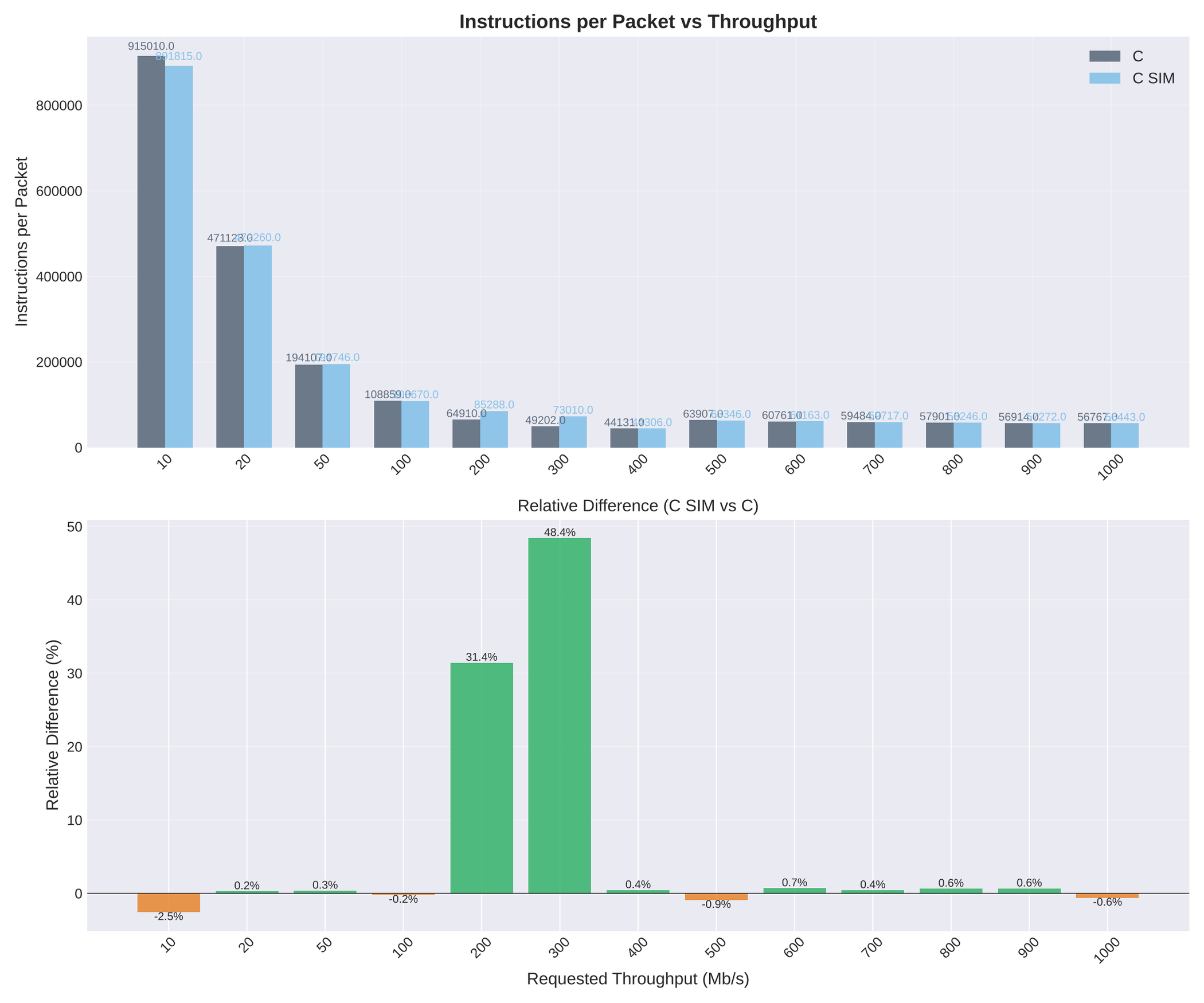

L1 I-TLB Misses per Packet vs Throughput
L1 I-TLB misses / Packet
C
C SIM
11.5
14.4
13.1
13.9
15.5
17.0
15.3
17.7
15.3
18.9
15.5
16.1
12.3
15.1
8.91
11.8
8.03
9.63
6.87
8.23
6.18
7.21
5.06
5.89
4.65
5.46
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
25.0%
6.0%
9.3%
15.8%
23.7%
3.9%
22.0%
32.5%
19.9%
19.8%
16.7%
16.4%
17.4%
Requested Throughput (Mb/s)


L1 D-TLB Misses per Packet vs Throughput
C
C SIM
L1 D-TLB misses / Packet
0
10
20
30
40
25.8
30.4
29.0
29.9
34.6
36.5
36.0
39.5
38.9
45.3
42.1
42.5
38.3
43.3
33.8
39.7
35.4
38.1
35.3
37.9
37.3
40.0
38.6
40.9
39.7
42.1
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
17.8%
3.0%
5.5%
9.8%
16.4%
1.0%
13.2%
17.3%
7.8%
7.4%
7.1%
6.0%
6.2%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

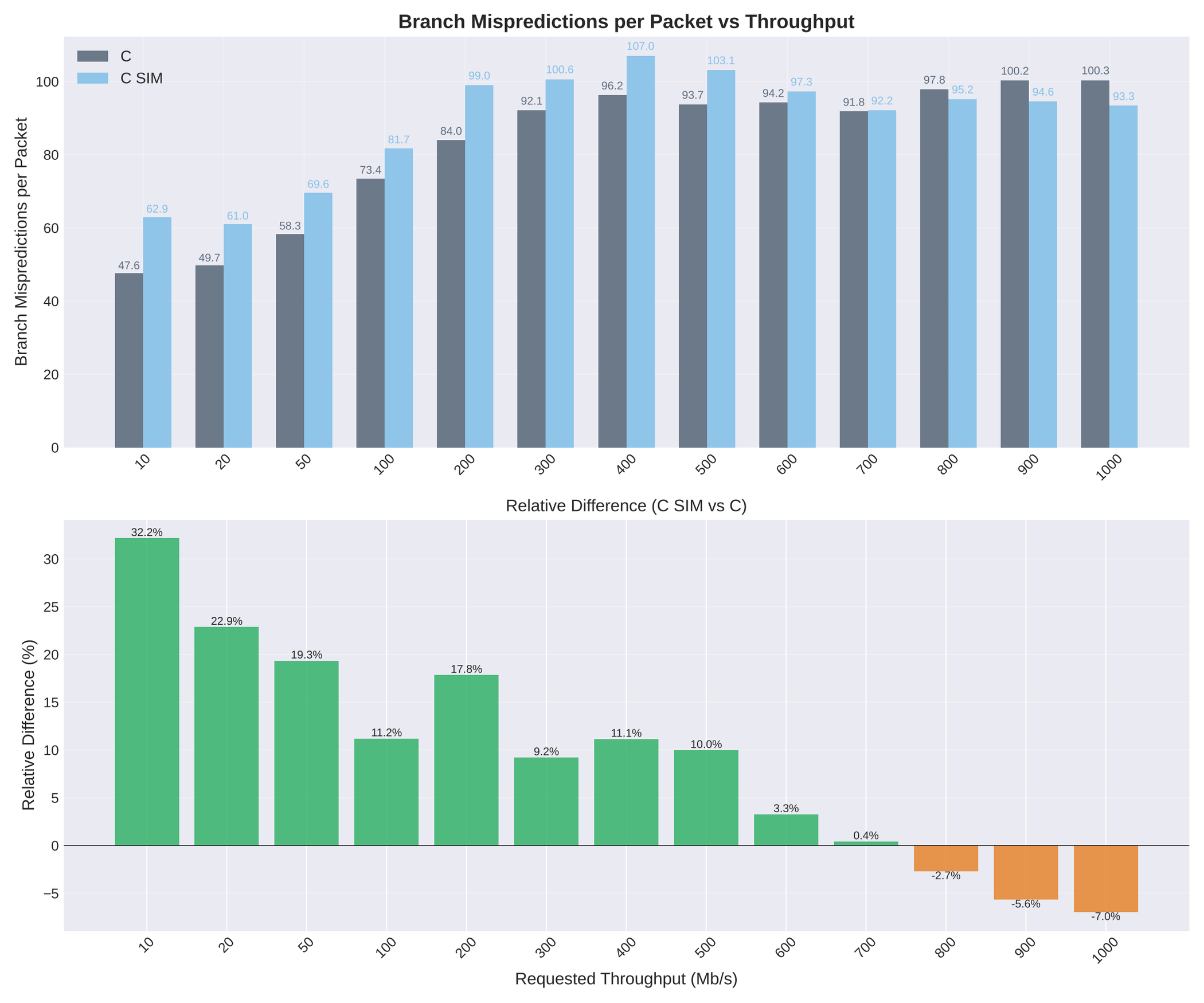

Instructions per Packet vs Throughput
instructions / Packet
C
C SIM
915010.0
891815.0
471123.0
470260.0
194107.0
197746.0
108859.0
110670.0
64910.0
85288.0
49202.0
73010.0
441310.0
440306.0
639070.0
640346.0
607610.0
610163.0
594840.0
597717.0
579010.0
580246.0
569140.0
570272.0
567670.0
568443.0
0
200000
400000
600000
800000
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
-2.5%
0.2%
0.3%
-0.2%
31.4%
48.4%
0.4%
-0.9%
0.7%
0.4%
0.6%
0.6%
-0.6%
0
10
20
30
40
50
Requested Throughput (Mb/s)


Branch Mispredictions per Packet vs Throughput
C
C SIM
Branch mis-pred / Packet
0
20
40
60
80
100
47.6
62.9
49.7
61.0
58.3
69.6
73.4
81.7
84.0
99.0
92.1
100.6
96.2
107.0
93.7
103.1
94.2
97.3
91.8
92.2
97.8
95.2
100.2
94.6
100.3
93.3
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−5
0
5
10
15
20
25
30
32.2%
22.9%
19.3%
11.2%
17.8%
9.2%
11.1%
10.0%
3.3%
0.4%
-2.7%
-5.6%
-7.0%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

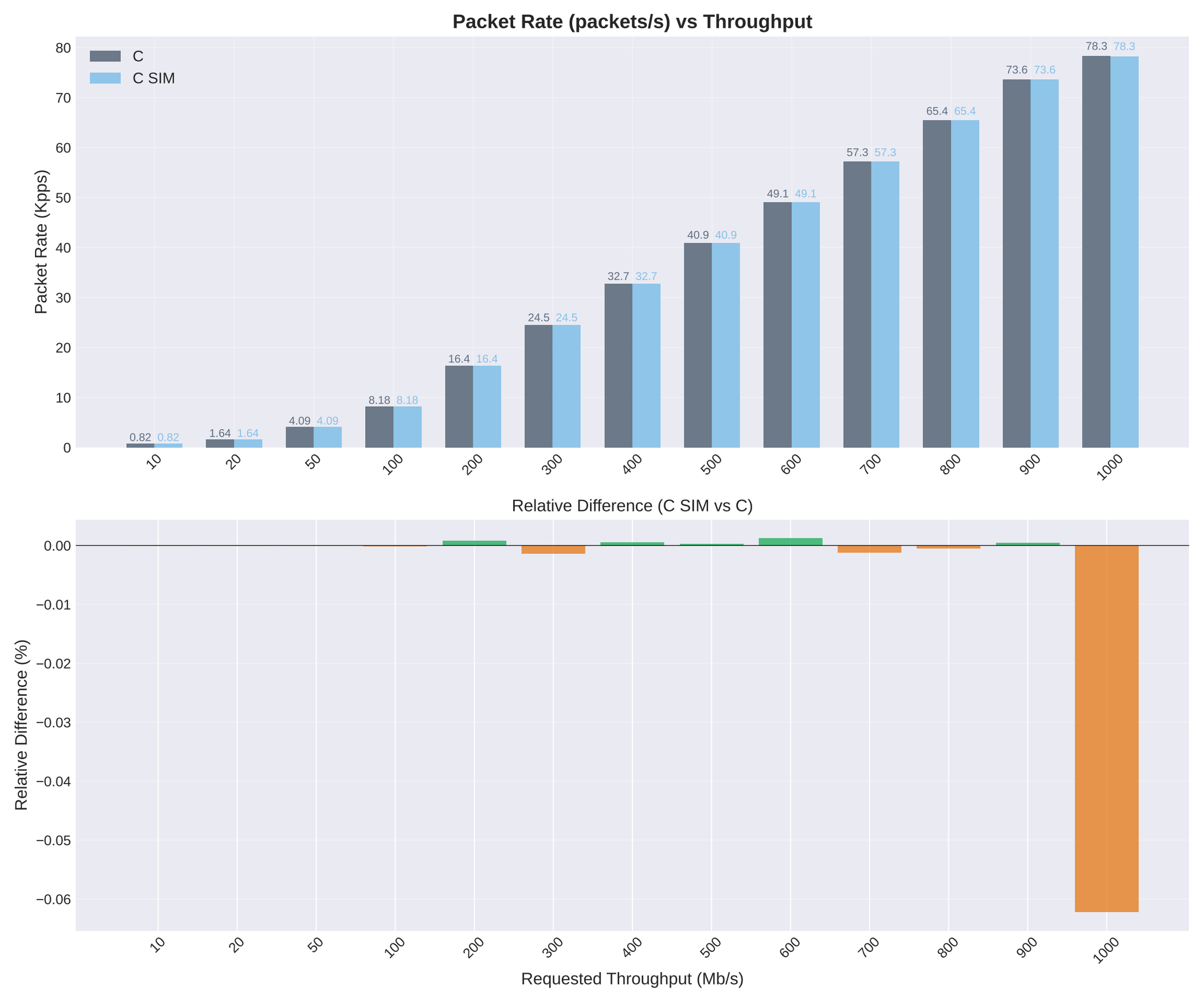

Cycles per Packet vs Throughput
1e6
Cycles per Packet
C
C SIM
1278868.0
1278940.0
690156.0
690155.0
337715.0
337693.0
219566.0
219458.0
161124.0
161117.0
141452.0
141449.0
131358.0
131360.0
125431.0
125429.0
121414.0
121429.0
119072.0
119072.0
116953.0
116964.0
115322.0
115332.0
115299.0
115488.0
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
-0.7%
Requested Throughput (Mb/s)

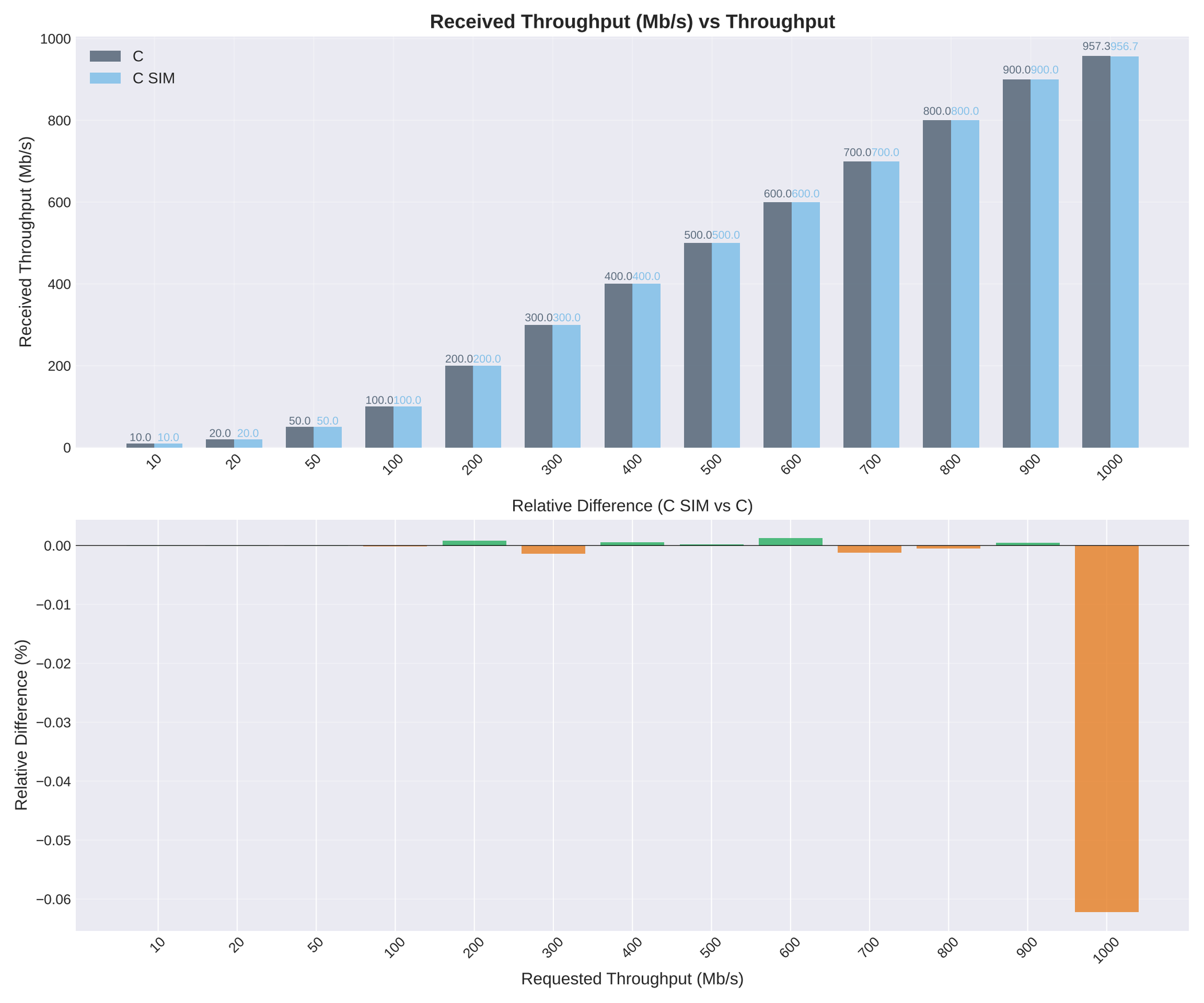


Instructions per Packet vs Throughput
C
C SIM
Instructions per Packet
0
200000
400000
600000
800000
915010.0
891815.0
471123.0
470260.0
194107.0
190746.0
108859.0
90670.0
64910.0
85288.0
49202.0
73010.0
44131.0
40306.0
63907.0
60346.0
60761.0
60163.0
59484.0
59717.0
57901.0
59246.0
56914.0
59272.0
56767.0
59443.0
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0
10
20
30
40
50
-2.5%
0.2%
0.3%
-0.2%
31.4%
48.4%
0.4%
-0.9%
0.7%
0.4%
0.6%
0.6%
-0.6%
Requested Throughput (Mb/s)


Branch Mispredictions per Packet vs Throughput
C
C SIM
Branch Mispredictions per Packet
0
20
40
60
80
100
47.6
62.9
49.7
61.0
58.3
69.6
73.4
81.7
84.0
99.0
92.1
100.6
96.2
107.0
93.7
103.1
94.2
97.3
91.8
92.2
97.8
95.2
100.2
94.6
100.3
93.3
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
−5
0
5
10
15
20
25
30
32.2%
22.9%
19.3%
11.2%
17.8%
9.2%
11.1%
10.0%
3.3%
0.4%
-2.7%
-5.6%
-7.0%
10
20
50
100
200
300
400
500
600
700
800
900
1000
Requested Throughput (Mb/s)

Mean Round-Trip Time (µs) vs Throughput
C
C SIM
Mean Round-Trip Time (µs)
1400
1200
1000
800
600
400
200
141.0
147.0
136.0
175.0
211.0
269.0
361.0
456.0
551.0
726.0
767.0
760.0
776.0
1359.0
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
20
15
10
5
0
−5
−10
0.7%
-9.5%
-5.1%
2.9%
-5.7%
4.8%
3.6%
20.8%
2.2%
-0.7%
0.4%
-1.0%
0.9%
Requested Throughput (Mb/s)


Packet Rate (packets/s) vs Throughput
C
C SIM
Packet Rate (Kpps)
0
10
20
30
40
50
60
70
80
0.82 0.82
1.64 1.64
4.09 4.09
8.18 8.18
16.4 16.4
24.5 24.5
32.7 32.7
40.9 40.9
49.1 49.1
57.3 57.3
65.4 65.4
73.6 73.6
78.3 78.3
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.00
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
Requested Throughput (Mb/s)


Received Throughput (Mb/s) vs Throughput
C
C SIM
Received Throughput (Mb/s)
1000
800
600
400
200
0
10.0 10.0
20.0 20.0
50.0 50.0
100.0 100.0
200.0 200.0
300.0 300.0
400.0 400.0
500.0 500.0
600.0 600.0
700.0 700.0
800.0 800.0
900.0 900.0
957.3 956.7
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.00
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
Requested Throughput (Mb/s)

Sent Throughput (Mb/s) vs Throughput
C
C SIM
Sent Throughput (Mb/s)
0
200
400
600
800
1000
10.0 10.0
20.0 20.0
50.0 50.0
100.0 100.0
200.0 200.0
300.0 300.0
400.0 400.0
500.0 500.0
600.0 600.0
700.0 700.0
800.0 800.0
900.0 900.0
1000.0 1000.0
10
20
50
100
200
300
400
500
600
700
800
900
1000
Relative Difference (C SIM vs C)
Relative Difference (%)
0.0004
0.0002
0.0000
−0.0002
Requested Throughput (Mb/s)