Lab-5 Report

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1

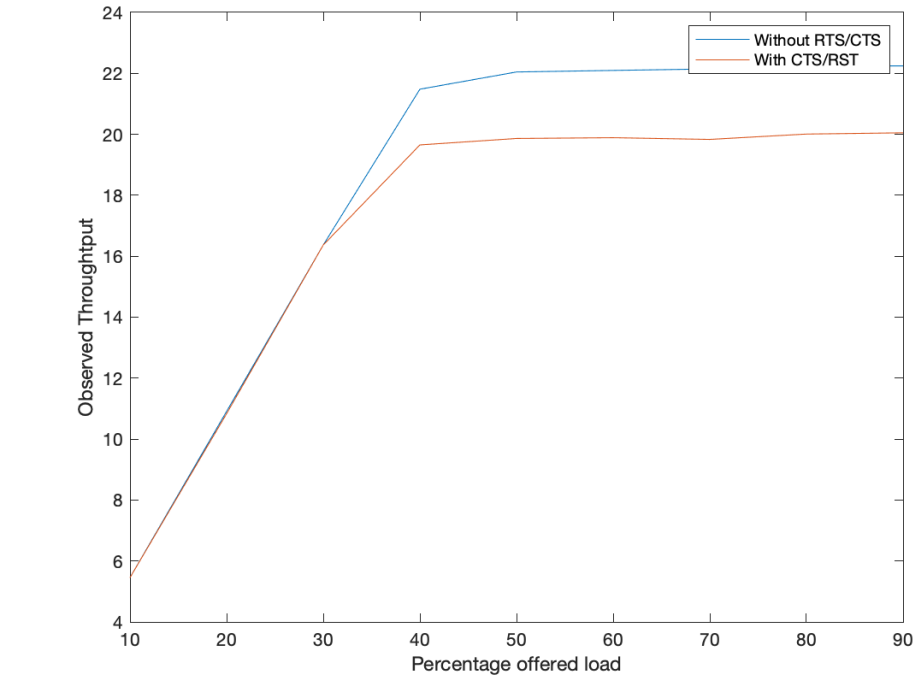
This is the standard hidden terminal problem, $A \rightarrow B \leftarrow C$. In this case RTS/CTS will improve the throughput since it is designed to avoid the collisions due to multiple hidden senders to a single source.

a) For the default parameters, the throughput values are:

FLOW	THROUGHPUT IN MBPS	THROUGHPUT IN MBPS (RTS/CTS)
Flow 1: $n1 \rightarrow n0$	9.71408	10.1113
Flow 2: $n2 \rightarrow n0$	9.37797	10.096
Total	**19.0921**	**20.2073**

b) Throughput values for varying data rate values:

PERCENTAGE LOAD	TOTAL OFFERED LOAD (MBPS)	THROUGHPUT	THROUGHPUT (RTS/CTS)
10 %	5.4	5.45414	5.45414
20 %	10.8	10.8344	10.9108
30 %	16.2	16.3675	16.3675
40 %	21.6	19.6522	21.4805
50 %	27.0	19.8636	22.0457
60 %	32.4	19.889	22.0967
70 %	37.8	19.883	22.145
80 %	43.2	20.0087	22.252
90 %	48.6	20.0495	22.2444



c) For single source, maximum throughput possible was **25.6182 Mbps** (for RTS/CTS disabled) and **22.6288** for (RTS/CTS enabled). The reason for slower throughput for RTS/CTS enabled protocaol is the wait time and other time gap for RTS/CTS which takes more time as compared to the standard protocol.

PERCENTAGE LOAD	TOTAL OFFERED LOAD (MBPS)	THROUGHPUT	THROUGHPUT (RTS/CTS)
10 %	5.4	5.45924	5.45924
20 %	10.8	10.921	10.921
30 %	16.2	16.3803	16.3803
40 %	21.6	21.842	21.842
50 %	27.0	25.6156	22.6645
60 %	32.4	25.6156	22.6288
70 %	37.8	25.6182	22.6288
80 %	43.2	25.6182	22.6288
90 %	48.6	25.6182	22.6288

d) All the data are attached above, both with RTS/CTS and without RTS/CTS.

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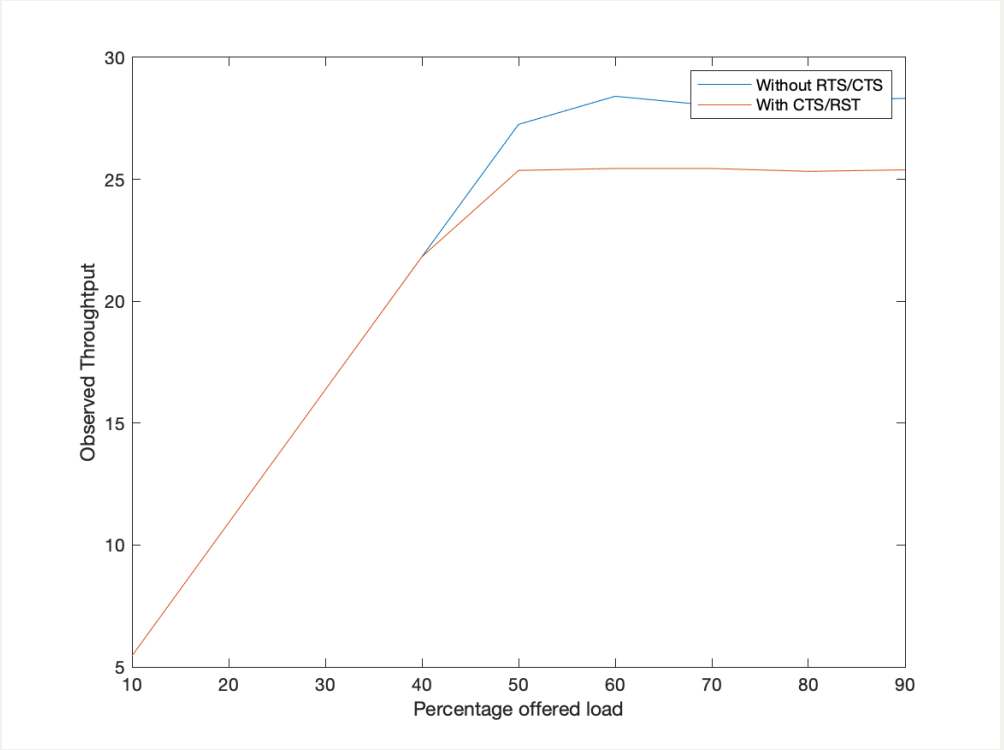
In this case, all the three nodes can hear each other. In this case similar to the 1c problem, throughput for RTS/CTS enabled protocal will be less as compared to the standard protocol, reason being the same, wait time b/w each transfer.

a)

PERCENTAGE LOAD	TOTAL OFFERED LOAD (MBPS)	THROUGHPUT	THROUGHPUT (RTS/CTS)
10 %	5.4	5.45414	5.45414
20 %	10.8	10.9108	10.9108
30 %	16.2	16.3675	16.3675
40 %	21.6	21.8242	21.8217
50 %	27.0	27.2529	25.3636
60 %	32.4	28.4064	25.445
70 %	37.8	28.0295	25.445
80 %	43.2	28.2383	25.3254
90 %	48.6	28.3198	25.389



b) Throughput data with and without RTS/CTS are attached

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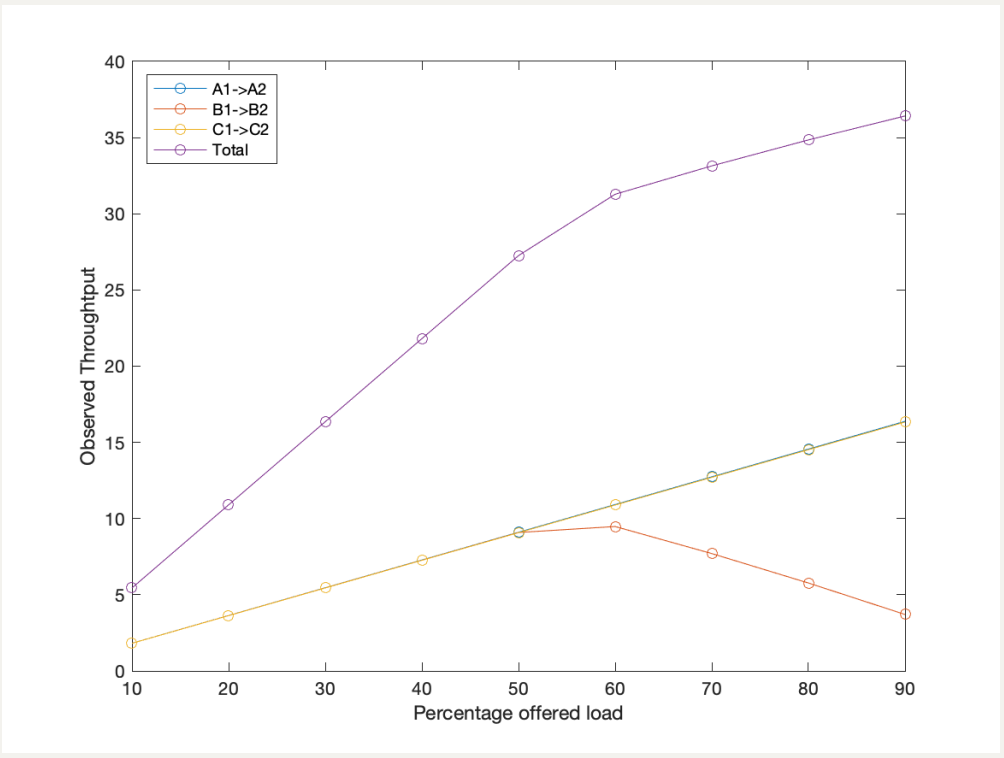
a) For the default parameters, the throughput values are:

FLOW	THROUGHPUT IN MBPS
$A1 \rightarrow A2$	10.1088
$B1 \rightarrow B2$	9.52565
$C1 \rightarrow C2$	10.0807
Total	**29.7152**

b) For smaller values (< 60%) of total offered load, throughput is close to offered load. After $\approx$ 60%, throughput became constant with any further increase in the total offered load.

PERCENTAGE LOAD	OFFERED LOAD (MBPS)	THROUGHPUT (CTS/RST)	$A1 \rightarrow A2$	$B1 \rightarrow B2$	$C1 \rightarrow C2$
10 %	5.4	5.44651	1.81805	1.8155	1.81296
20 %	10.8	10.9006	3.63864	3.63355	3.62846
30 %	16.2	16.3548	5.45924	5.4516	5.44396
40 %	21.6	21.8064	7.27983	7.2671	7.25946
50 %	27.0	27.258	9.10043	9.08515	9.07242
60 %	32.4	31.2837	10.9185	9.47728	10.8879
70 %	37.8	33.145	12.7391	7.70251	12.7034
80 %	43.2	34.8485	14.5597	5.7698	14.5189
90 %	48.6	36.4195	16.3803	3.70485	16.3344



c) For small data rates (< 50%), throughput values are similar for all three flows. But for larger values, CBR flow rate for $B1 \rightarrow B2$ decreases and for other two flows it remains same. Reason for this is the interruption to the flow $B1 \rightarrow B2$ by both the other flows. Since Bs are in the middle in topology they are interrupted more as compared to flow $A1 \rightarrow A2$ and $C1 \rightarrow C2$. Also $T_a \approx T_c$, since both are symmetrically placed in the topology. It is not exactly same because of different start time (assumed because of machine/human error in practical experiments).

$$T_a \approx T_c \geq T_b$$

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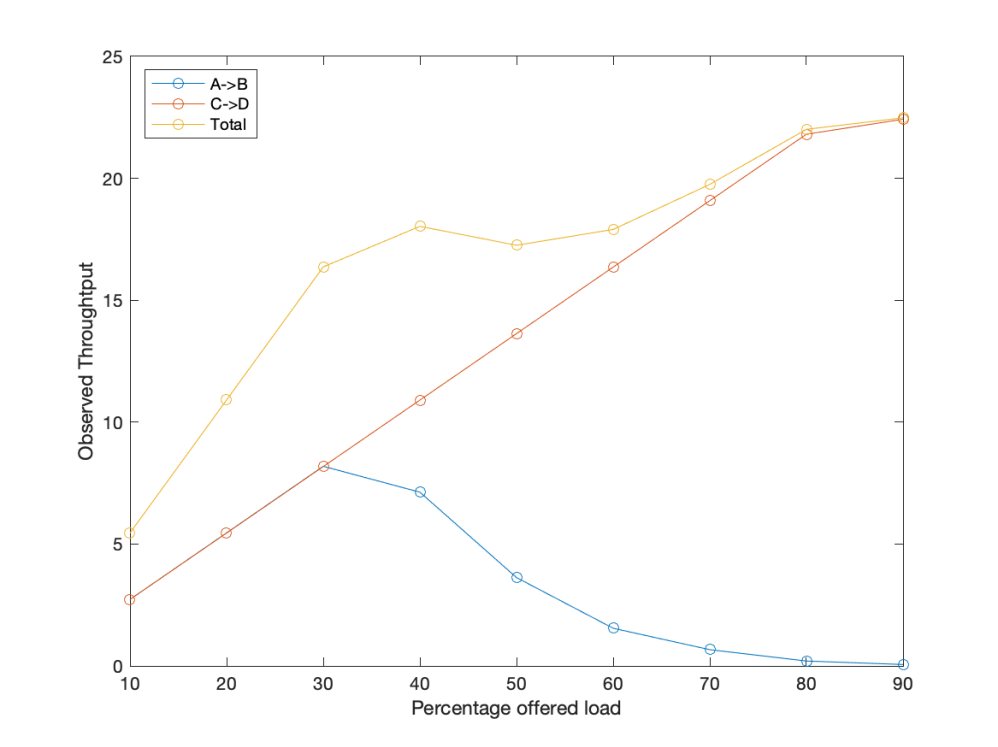
a) For the default parameters, the throughput values are:

FLOW	THROUGHPUT IN MBPS
Flow 1: $A \rightarrow B$	8.24233
Flow 2: $C \rightarrow D$	10.096
Total	**18.3383**

b) For smaller values (< 30%) of total offered load, throughput is close to offered load. After $\approx$ 60%, throughput became constant with any further increase in the total offered load.

PERCENTAGE LOAD	TOTAL OFFERED LOAD (MBPS)	THROUGHPUT (RTS/CTS)	$A \rightarrow B$	$C \rightarrow D$
10 %	5.4	5.45414	2.72962	2.72453
20 %	10.8	10.9108	5.45924	5.4516
30 %	16.2	16.3675	8.18885	8.17867
40 %	21.6	18.0302	7.12705	10.9032
50 %	27.0	17.2536	3.62336	13.6303
60 %	32.4	17.9029	1.5456	16.3573
70 %	37.8	19.7515	0.667127	19.0844
80 %	43.2	22.0101	0.201157	21.8089
90 %	48.6	22.4812	0.0585646	22.4226



c) For small values of data rate, throughput is almost same for both the flows but for larger data rates, throughput value of flow $A \rightarrow B$ decreased rapidly. Reason behind this is the RTS/CTS protocol. For the flow $A \rightarrow B$, A will send RTS which only B can hear and in response B will send CTS which both A and C can hear. This will cause C to stop the flow. But for the flow $C \rightarrow D$, C will send RTS which both D and B can hear. And so B will stop sending it's CTS to A.

So the interrupting signals are $C's$ RTS and DATA for flow $A \rightarrow B$ and $B's$ CTS for flow $C \rightarrow D$. Clearly $length(DATA + RTS) \gg length(CTS)$, so the flow $A \rightarrow B$ will be more interrupted.

$$T_c \geq T_a$$
