CS 252: Lab 5

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April 9, 2021

Contents

Question 1

a.

For default parameters (`dataRate` = 10.0Mbps),

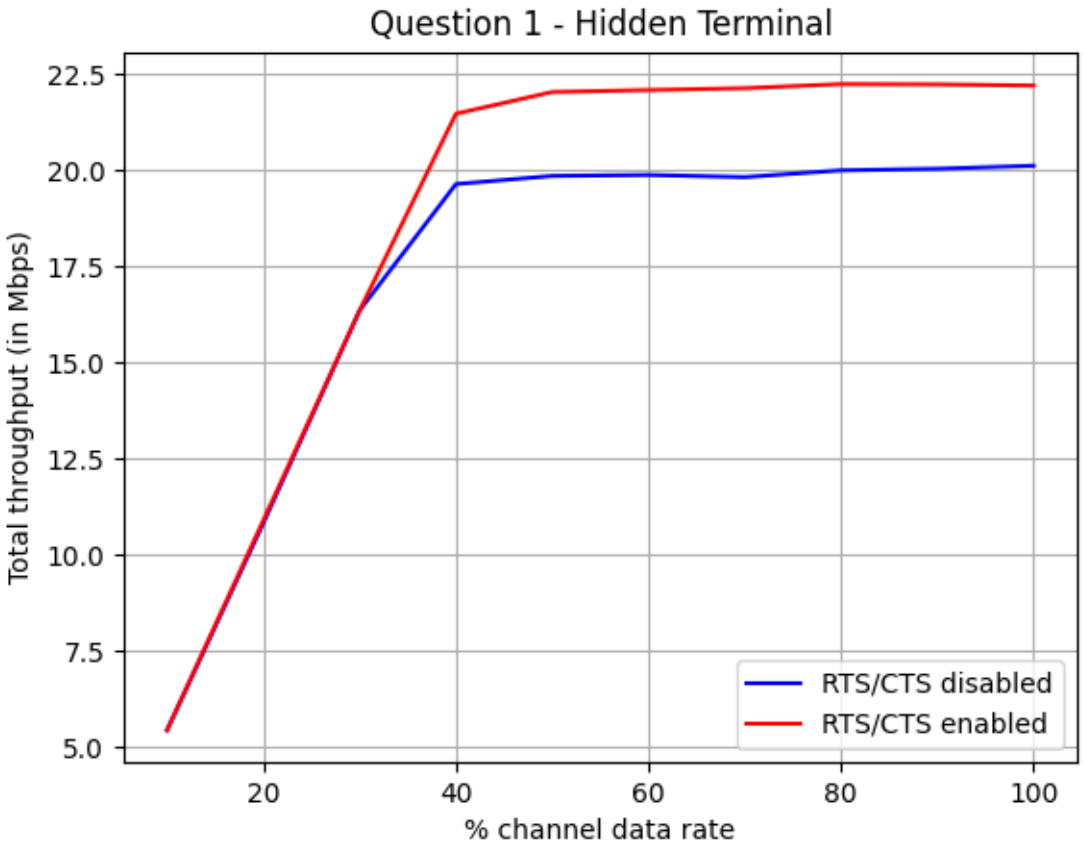
Throughput for Flow 1 (Node n1 → Node n0):
9.71408 Mbps (RTS/CTS disabled), 10.1113 Mbps (RTS/CTS enabled)

Throughput for Flow 2 (Node n2 → Node n0):
9.37797 Mbps (RTS/CTS disabled), 10.096 Mbps (RTS/CTS enabled)

Total Channel Throughput:
19.0921 Mbps (RTS/CTS disabled), 20.2073 Mbps (RTS/CTS enabled)

b.

Channel data rate is 54 Mbps.



Total Data Rate Offered	`dataRate`	Total Throughput	
		RTS/CTS disabled	RTS/CTS enabled
10% of channel date rate	2.7Mbps	5.45414 Mbps	5.45414 Mbps
20% of channel date rate	5.4Mbps	10.8344 Mbps	10.9108 Mbps
30% of channel date rate	8.1Mbps	16.3675 Mbps	16.3675 Mbps
40% of channel date rate	10.8Mbps	19.6522 Mbps	21.4805 Mbps
50% of channel date rate	13.5Mbps	19.8636 Mbps	22.0457 Mbps
60% of channel date rate	16.2Mbps	19.889 Mbps	22.0967 Mbps
70% of channel date rate	18.9Mbps	19.833 Mbps	22.145 Mbps
80% of channel date rate	21.6Mbps	20.0087 Mbps	22.252 Mbps
90% of channel date rate	24.3Mbps	20.0495 Mbps	22.2444 Mbps
100% of channel date rate	27.0Mbps	20.1284 Mbps	22.2138 Mbps

We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end.
We also see that RTS/CTS disabled network has less maximum throughput than RTS/CTS enabled network.

c.

Only Flow 1 (Node n1 → Node n0)
RTS/CTS disabled: Total throughput saturates at 25.6182 Mbps for `dataRate` = 35 Mbps.
RTS/CTS enabled: Total throughput saturates at 22.6339 Mbps for `dataRate` = 24 Mbps.

We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end.
We also see that RTS/CTS disabled network has more maximum throughput than RTS/CTS enabled network.

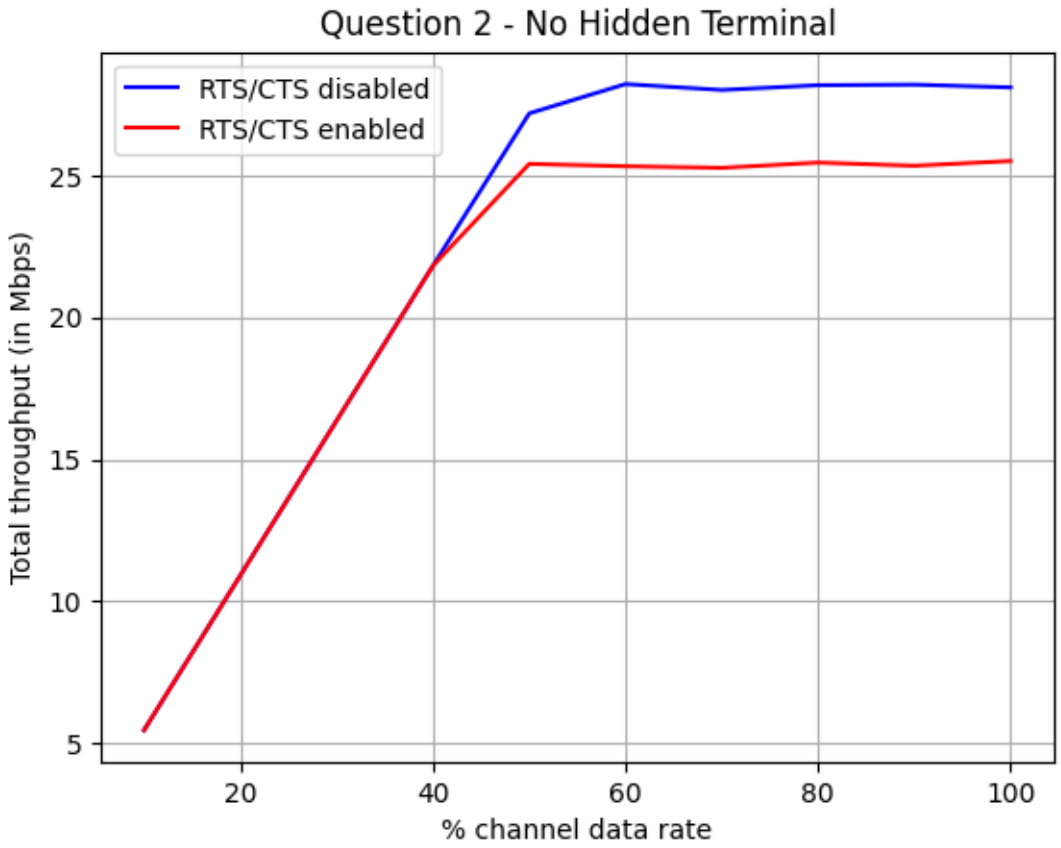
d.

- Total throughput is less than total data rate offered in all cases.
- We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end, both for two source and one source
- We also see that RTS/CTS disabled network has less maximum throughput than RTS/CTS enabled network when we have two sources but has more maximum throughput when we have only one source.
- We reach saturation for both cases when total data rate offered is about 40% of channel data rate.

Question 2

a.

Channel data rate is 54 Mbps.



Total Data Rate Offered	`dataRate`	Total Throughput	
		RTS/CTS disabled	RTS/CTS enabled
10% of channel date rate	2.7Mbps	5.45414 Mbps	5.45414 Mbps
20% of channel date rate	5.4Mbps	10.9108 Mbps	10.9108 Mbps
30% of channel date rate	8.1Mbps	16.3675 Mbps	16.3675 Mbps
40% of channel date rate	10.8Mbps	21.8242 Mbps	21.8242 Mbps
50% of channel date rate	13.5Mbps	27.1943 Mbps	25.4145 Mbps
60% of channel date rate	16.2Mbps	28.2281 Mbps	25.3305 Mbps
70% of channel date rate	18.9Mbps	28.0193 Mbps	25.2744 Mbps
80% of channel date rate	21.6Mbps	28.1874 Mbps	25.4603 Mbps
90% of channel date rate	24.3Mbps	28.2078 Mbps	25.3483 Mbps
100% of channel date rate	27.0Mbps	28.111 Mbps	25.5163 Mbps

We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end.
We also see that RTS/CTS disabled network has more maximum throughput than RTS/CTS enabled

network.

b.

- Total throughput is less than total data rate offered in all cases.
- We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end, both for two source and one source
- We also see that RTS/CTS disabled network has more maximum throughput than RTS/CTS enabled network.
- We reach saturation for both cases when total data rate offered is about 50% of channel data rate.
- The saturation level as compared to Question 1 (where a hidden terminal pair was present) is more for both cases.

Question 3

a.

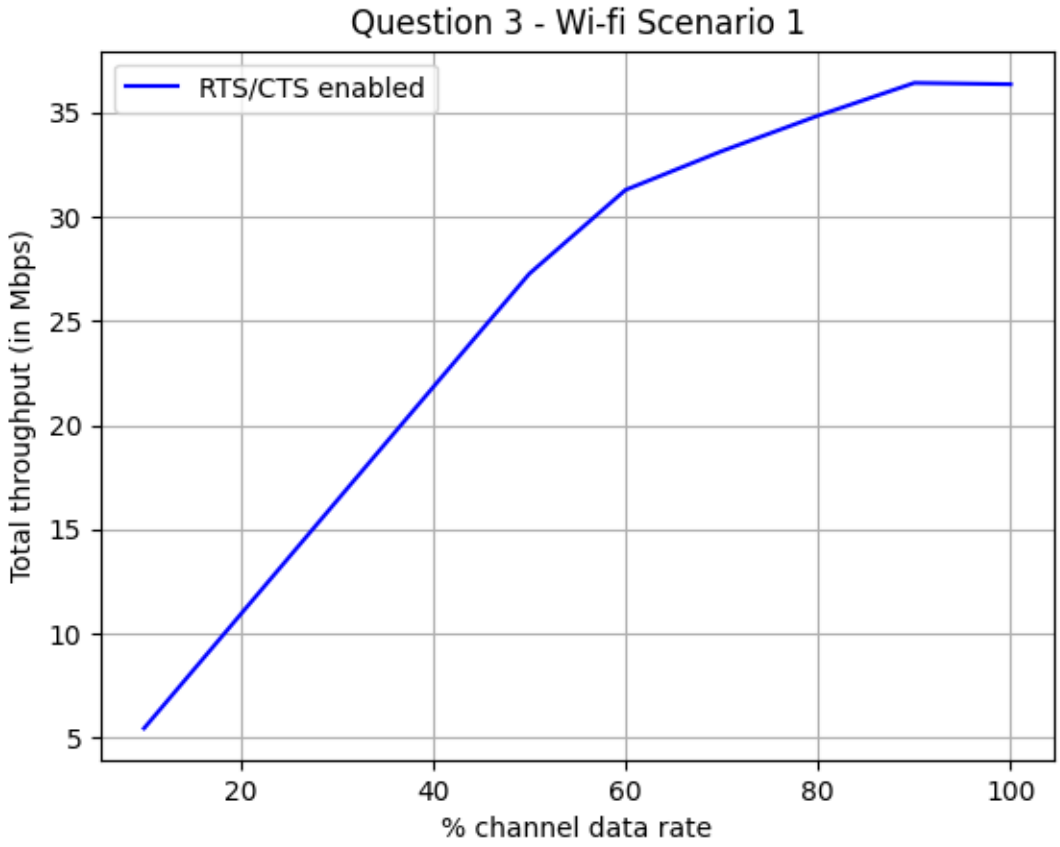
For default parameters (`dataRate` = 10.0Mbps),

Throughput for Flow 1 (Node A1 → Node A2): 10.1088 Mbps (RTS/CTS enabled)
Throughput for Flow 2 (Node B1 → Node B2): 9.52565 Mbps (RTS/CTS enabled)
Throughput for Flow 3 (Node C1 → Node C2): 10.0807 Mbps (RTS/CTS enabled)

Total Channel Throughput: 29.7152 Mbps (RTS/CTS enabled)

b.

Channel data rate is 54 Mbps.



Total Data Rate Offered	`dataRate`	Total Throughput
10% of channel date rate	1.8Mbps	5.44651 Mbps
20% of channel date rate	3.6Mbps	10.9006 Mbps
30% of channel date rate	5.4Mbps	16.3548 Mbps
40% of channel date rate	7.2Mbps	21.8064 Mbps
50% of channel date rate	9.0Mbps	27.258 Mbps
60% of channel date rate	10.8Mbps	31.2837 Mbps
70% of channel date rate	12.6Mbps	33.145 Mbps
80% of channel date rate	14.4Mbps	34.8485 Mbps
90% of channel date rate	16.2Mbps	36.4195 Mbps
100% of channel date rate	18.0Mbps	36.3559 Mbps

We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end.

c.

- Total throughput is less than total data rate offered.
- We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end.
- We reach saturation when total data rate offered is about 90% of channel data rate.
- Comparing between the flows, we can see that Throughputs of Flow 1 and Flow 3 are almost equal. This can be seen easily by symmetry.
- Throughputs of Flow 1 and Flow 3 are more than Flow 2. If we take different cases of who sends first among A1. B1, C1.

Question 4

a.

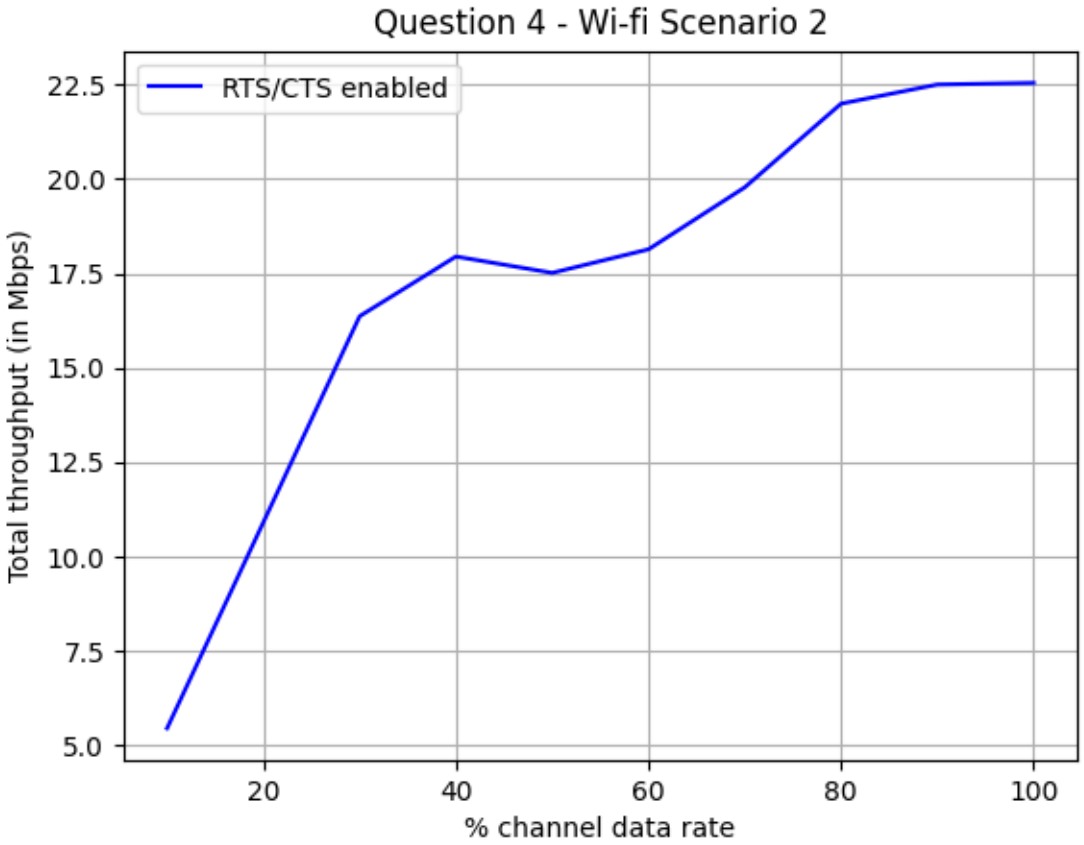
For default parameters (`dataRate` = 10.0Mbps),

Throughput for Flow 1 (Node A → Node B): 7.79927 Mbps (RTS/CTS enabled)
Throughput for Flow 2 (Node C → Node D): 10.096 Mbps (RTS/CTS enabled)

Total Channel Throughput: 17.8953 Mbps (RTS/CTS enabled)

b.

Channel data rate is 54 Mbps.



Total Data Rate Offered	`dataRate`	Total Throughput
10% of channel date rate	2.7Mbps	5.45414 Mbps
20% of channel date rate	5.4Mbps	10.9108 Mbps
30% of channel date rate	8.1Mbps	16.3675 Mbps
40% of channel date rate	10.8Mbps	17.9462 Mbps
50% of channel date rate	13.5Mbps	17.5159 Mbps
60% of channel date rate	16.2Mbps	18.1397 Mbps
70% of channel date rate	18.9Mbps	19.7821 Mbps
80% of channel date rate	21.6Mbps	21.9974 Mbps
90% of channel date rate	24.3Mbps	22.5041 Mbps
100% of channel date rate	27.0Mbps	22.5474 Mbps

We can see that Total throughput increases with Offered Load and almost flattens to a constant value by the end with a minor dip in middle.

c.