EE597_Lab1_Evaluation

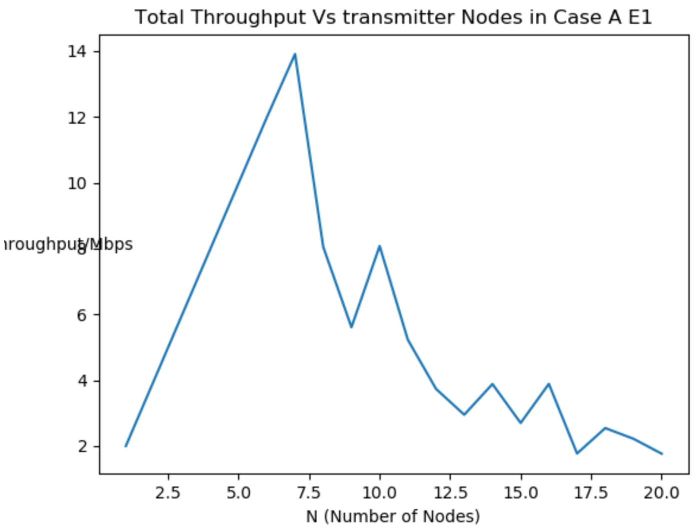
Accomplished by Qiushi Xu and Yiyi Li

In this project, we use the “IdeaWifiManager” as the station remote manager, and we set the transmitters as a cycle around the AP.

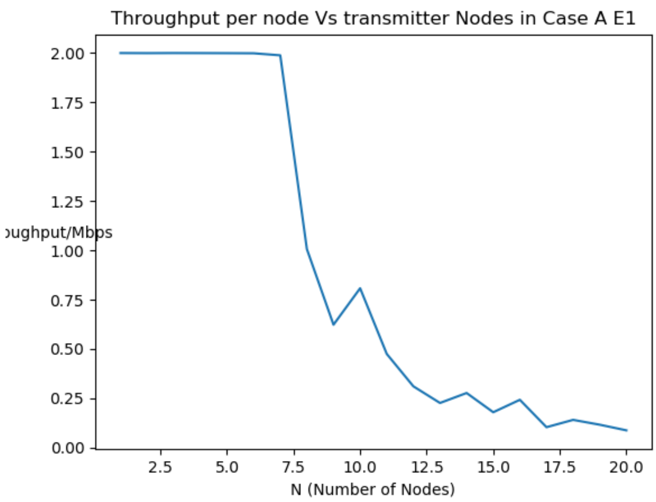
Case A: **minimum backoff window size as 1 and maximum backoff window size as 1023 units of slot times.**

E1: Increase the number of nodes N and set the data rate R fixed as 2Mpbs.

In this case, we set the number of nodes ranges from 1 to 20 and save the output in file CaseA_E1.csv. The total throughput will increase as the number of nodes increases before the collision happens. However, when the number of nodes is greater than 5, it is likely that the collision will happen, and this will cause the decrease of total throughput.

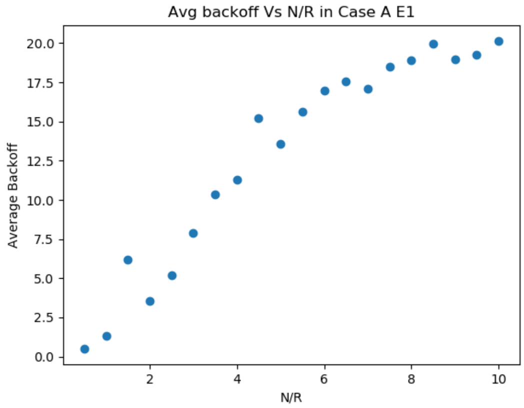


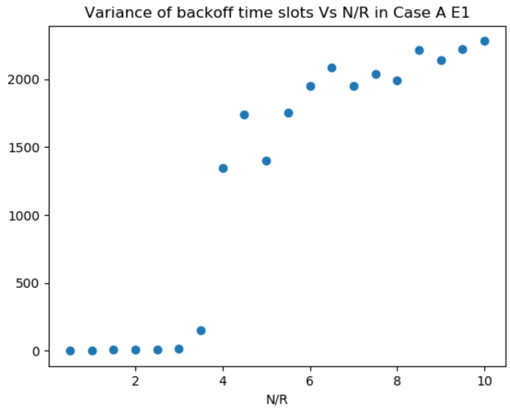
The relationship between the throughput per-node is similar to the total throughput. When there is no collision, the average throughput keeps the same. However, when the collision happened, the average throughput decreases immediately.



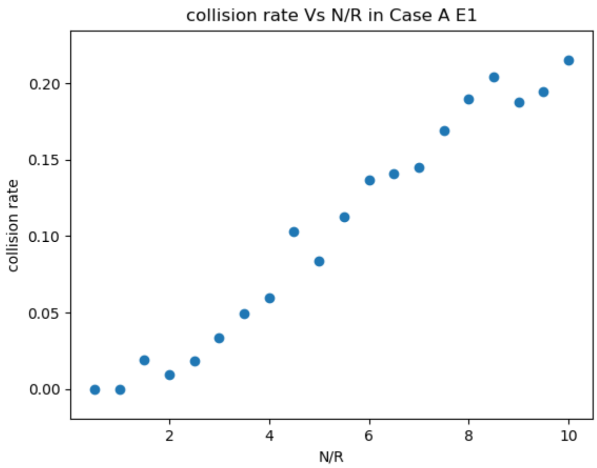
The average backoff time slot per transmission Vs N/R is shown below.

As the number of transmitter nodes increases, the possibility of transmitting while there is another transaction in the link increases. In this way, more transmissions need to be wait, and the average backoff slot time increases as well.



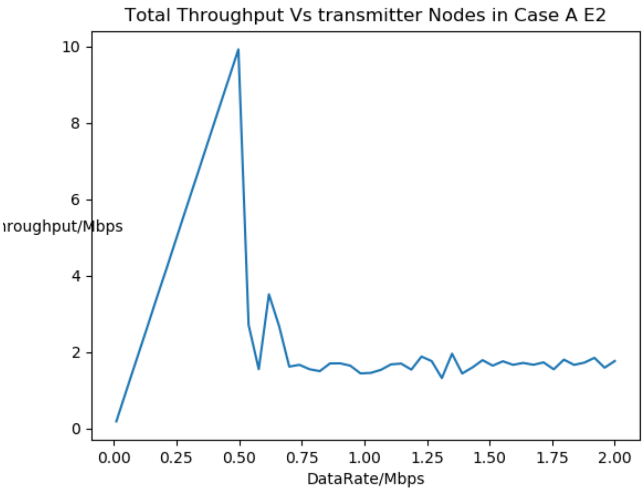


As I mentioned above, as the number of transmitter nodes increases, the collision possibility increases as well. For Case A E1, N/R increases as the number of nodes N increases. The figure is shown below.

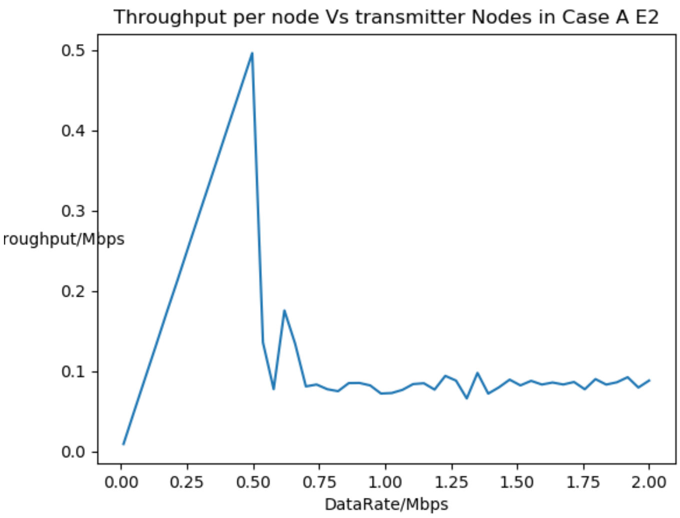


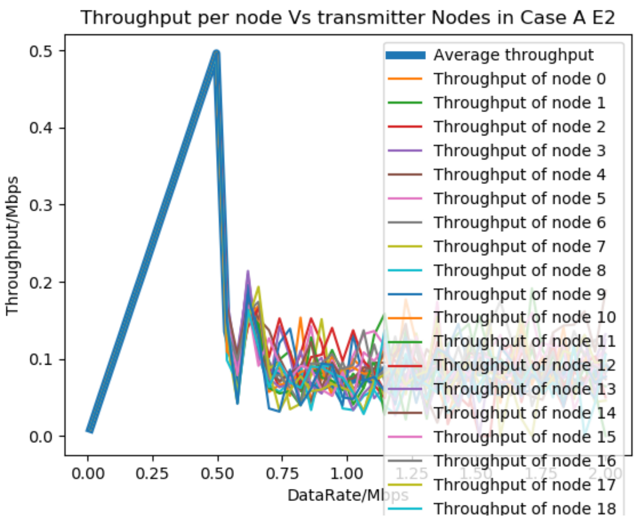
E2: Vary the data rate R and set the number of nodes N as fixed 20.

Compared with the E1, we fixed the number of nodes as 20, and vary the data rate range from 0.01 to 2 Mpbs and save the output in file CaseA_E1.csv. The throughput increases as the data rate increases when the data rate is less than 0.25 Mpbs. However, after the data rate is greater than 0.5 Mpbs, the throughput will remain the same.

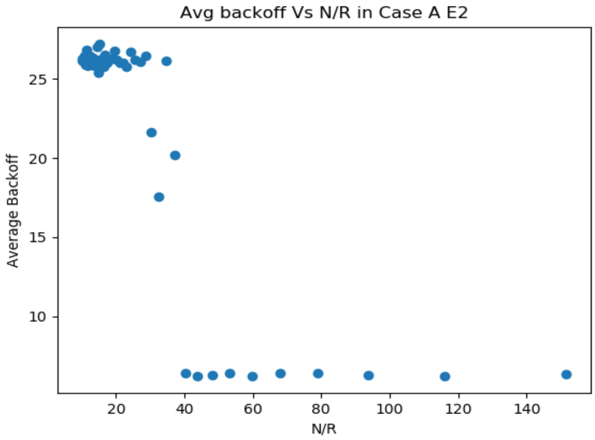


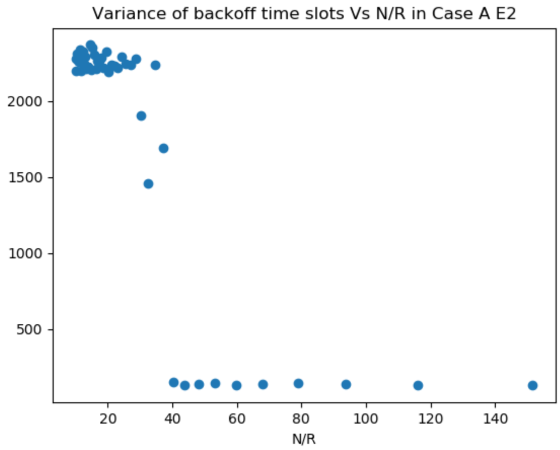
Since we fixed the number of nodes, when the total throughput gets increased or remains the same, the average throughput also does the same thing. And this is why the trend of throughput per node Vs data rate is the same as the total throughput Vs data rate.



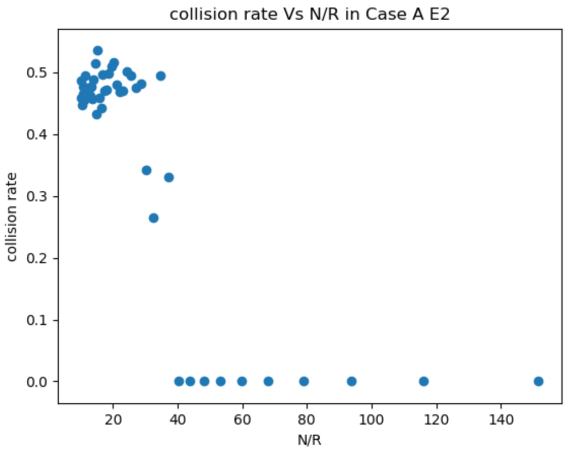


For the average backoff time slot, N/R decreases while R increases. When R is small, there is no collision, which means the backoff time slots will be 0. However, with the increase of data rate, the possibility that transmit while other transmitter is transmitting increases, and this increasing probability cause the increase of average backoff time slots.





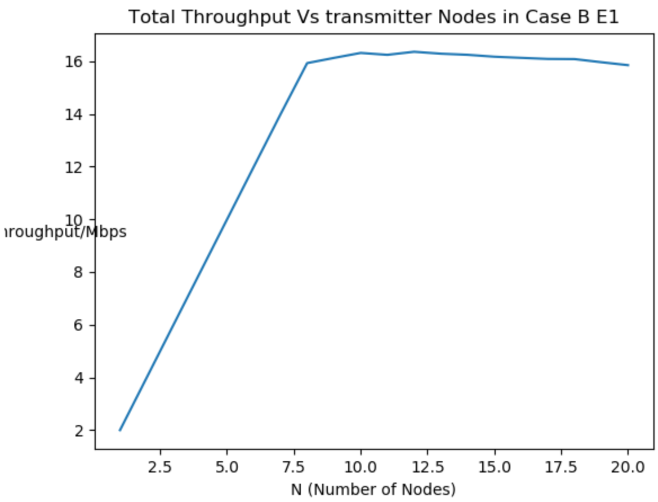
The collision rate is the same as the backoff time slots.



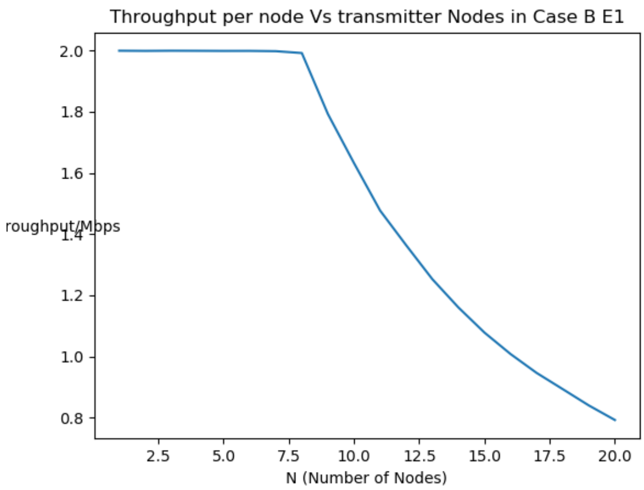
Case B: **minimum backoff window size as 63 and maximum backoff window size as 127 units of slot times.**

E1: Increase the number of nodes N and set the data rate R fixed as 2Mpbs.

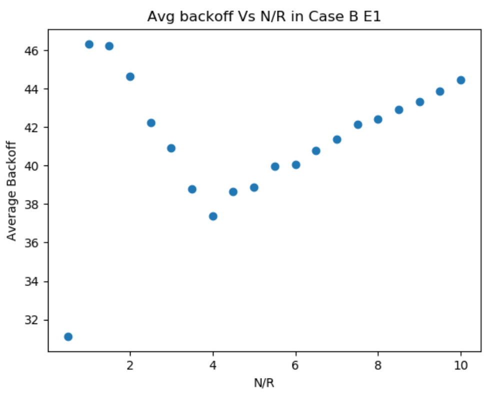
Like in Case A, before the collision happened, the total throughput increases as the transmitter nodes increases, and after the collision happened, both the total throughput and the throughput per node start to decrease. However, the difference is the minimum backoff window size is 63, which means the collision will be less likely to happen even though the number of nodes gets bigger, and this cause the smoother reduction of total throughput.

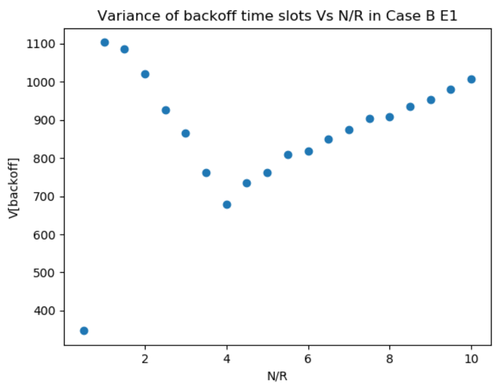


With the number of nodes increasing, although there isn't a sudden reduction in the total throughput, the throughput per node still get reduction, since throughput per node = total throughput / number of nodes.

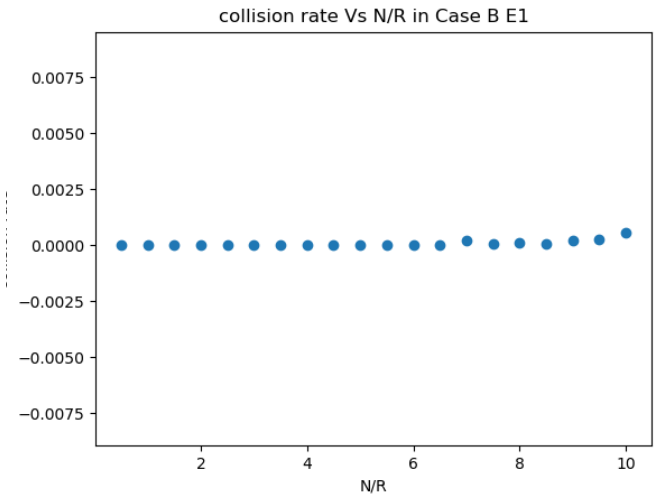


The average and variance of backoff time slots are shown below.
As we mentioned before, the likelihood of collision increases smooth because of the high minimum backoff window. So, it is reasonable that the backoff window increases slower than the number of nodes increases.



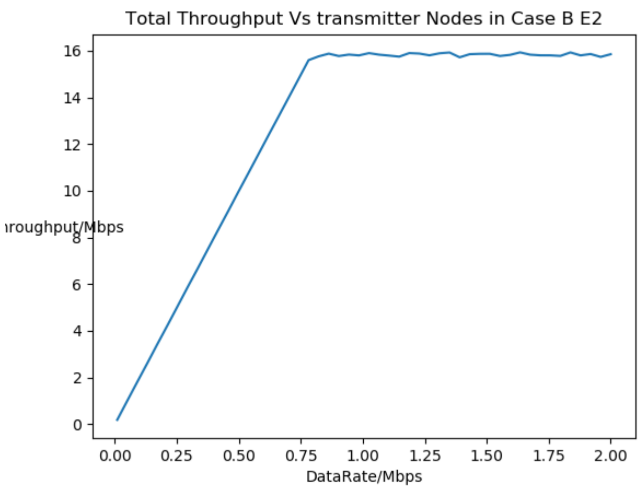


The collision rate is also much lower than that in Case 1 because of the higher minimum backoff window.

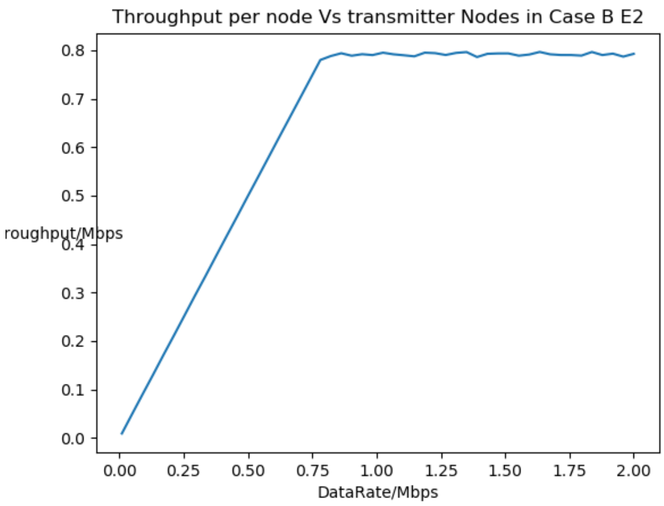


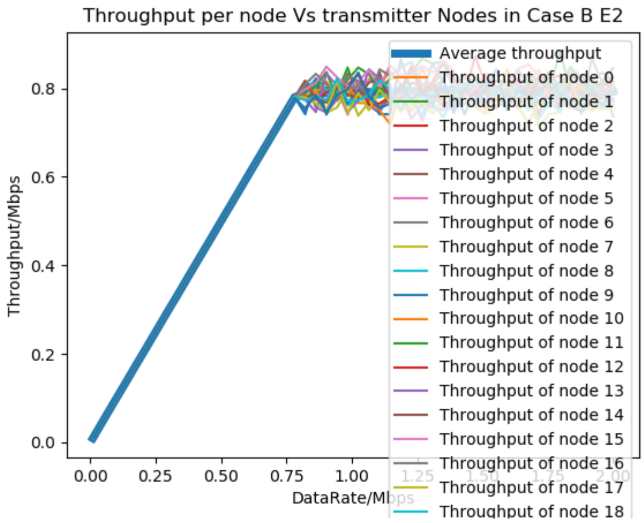
E2: Vary the data rate R and set the number of nodes N as fixed 20.

Compared with the E1, we fixed the number of nodes as 20, and vary the data rate range from 0.01 to 2 Mpbs. Similar to Case B E1, because of the high minimum backoff window, it is less likely to cause collision during the simulation. And the total throughput is also higher than in Case A E2, although the total throughput is also remain the same when the data rate is greater than 0.75 Mbps.

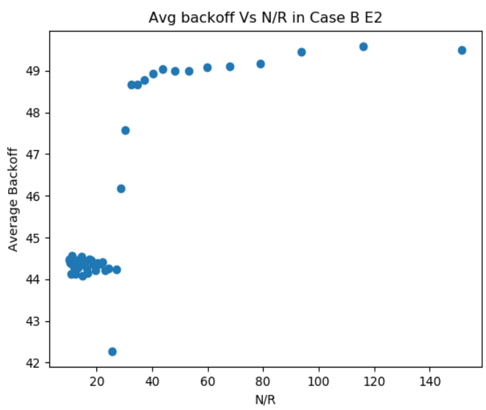


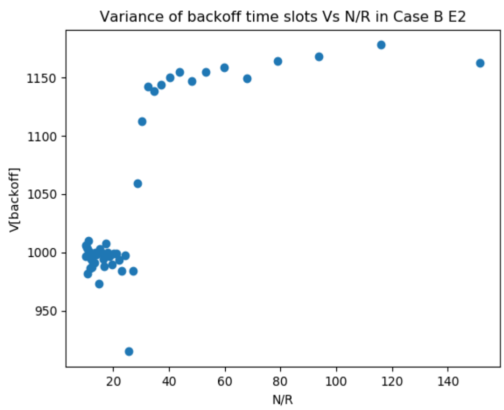
Since we fixed the number of nodes, when the total throughput gets increased or remains the same, the average throughput also does the same thing. And this is why the trend of throughput per node Vs data rate is the same as the total throughput Vs data rate.





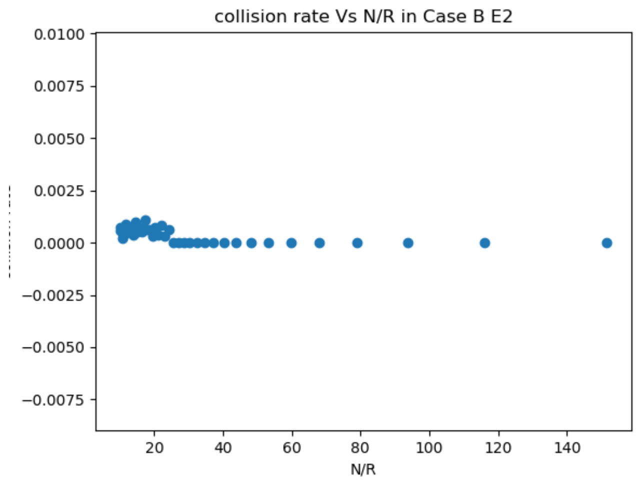
The average backoff time slots, compared with Case A E2, is clustered at the range [44, 45]. The reason why it is greater then that in Case A, I think, is that the minimum backoff time slots is





greater than that in Case A.

The collision rate, like Case B E1, is also close to 0, and much smaller than that in Case A.


collision rate Vs N/R in Case B E2
0.0100
0.0075
0.0050
0.0025
0.0000
−0.0025
−0.0050
−0.0075
20
40
60
80
100
120
140
N/R