ECE/CS438
MP4 Report
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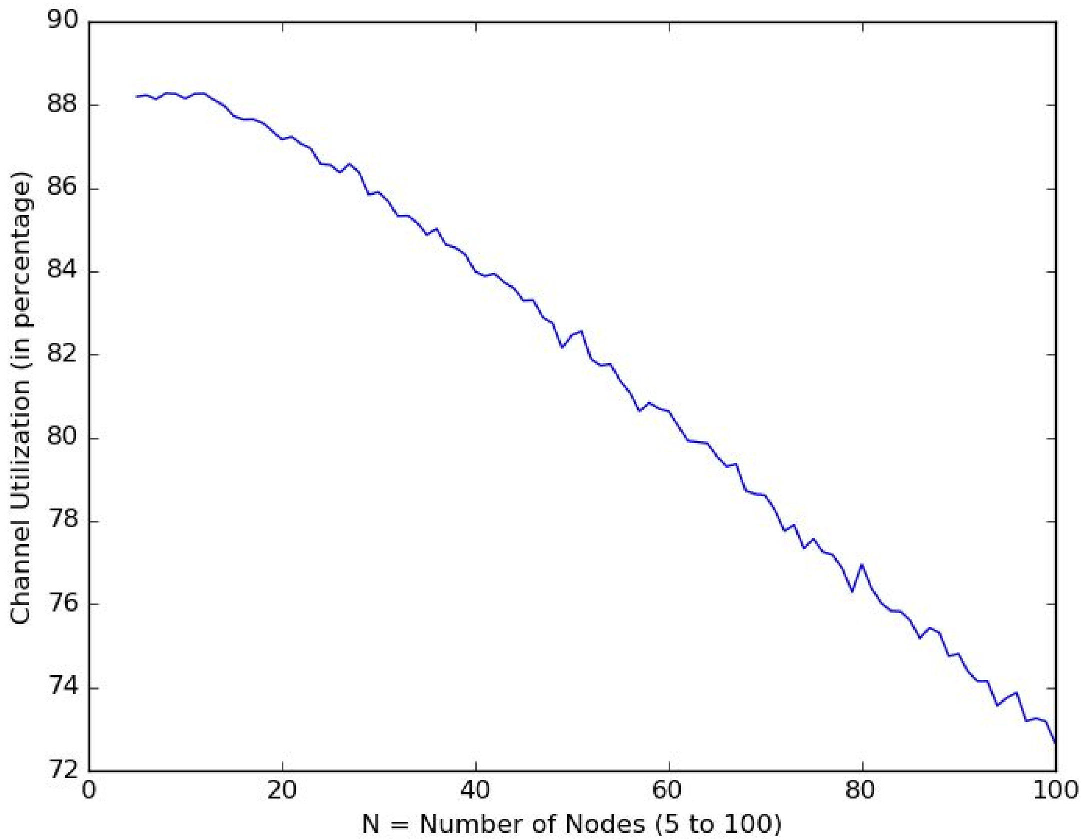
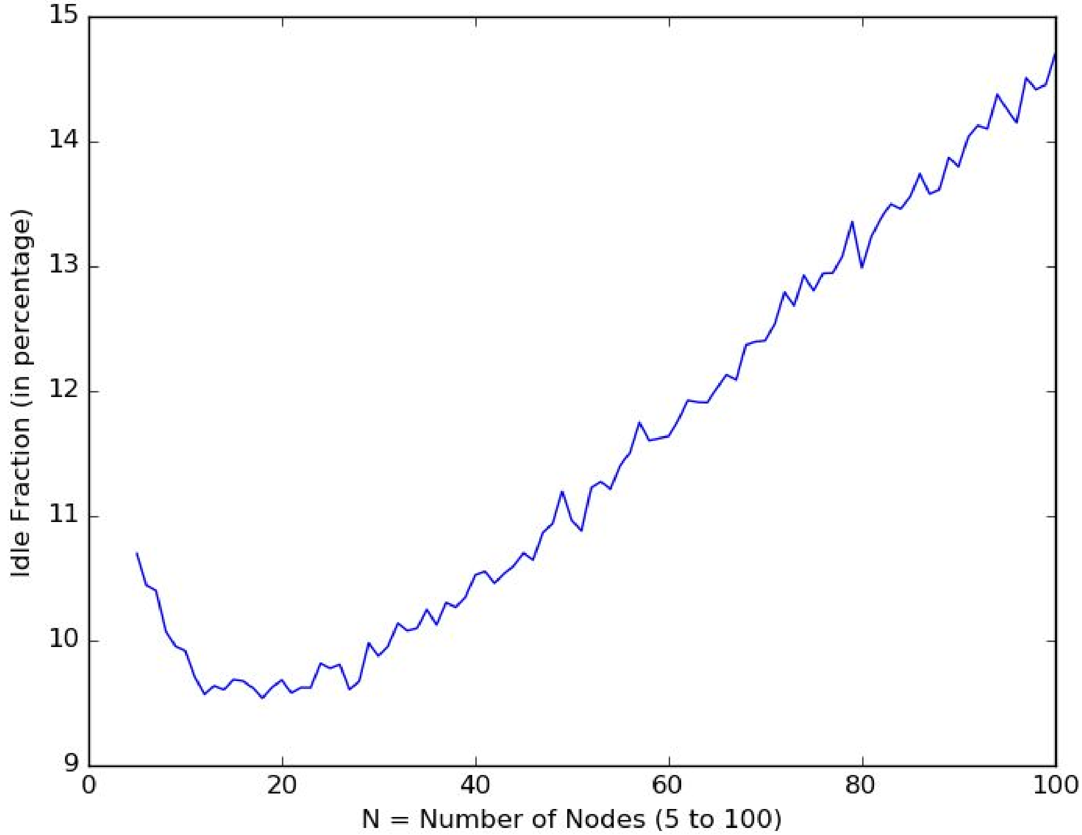
Assuming parameters N=25, L=20, R=8 16 32 64 128, M=6, T=50,000.

a. Plotting channel utilization vs. Number of nodes:



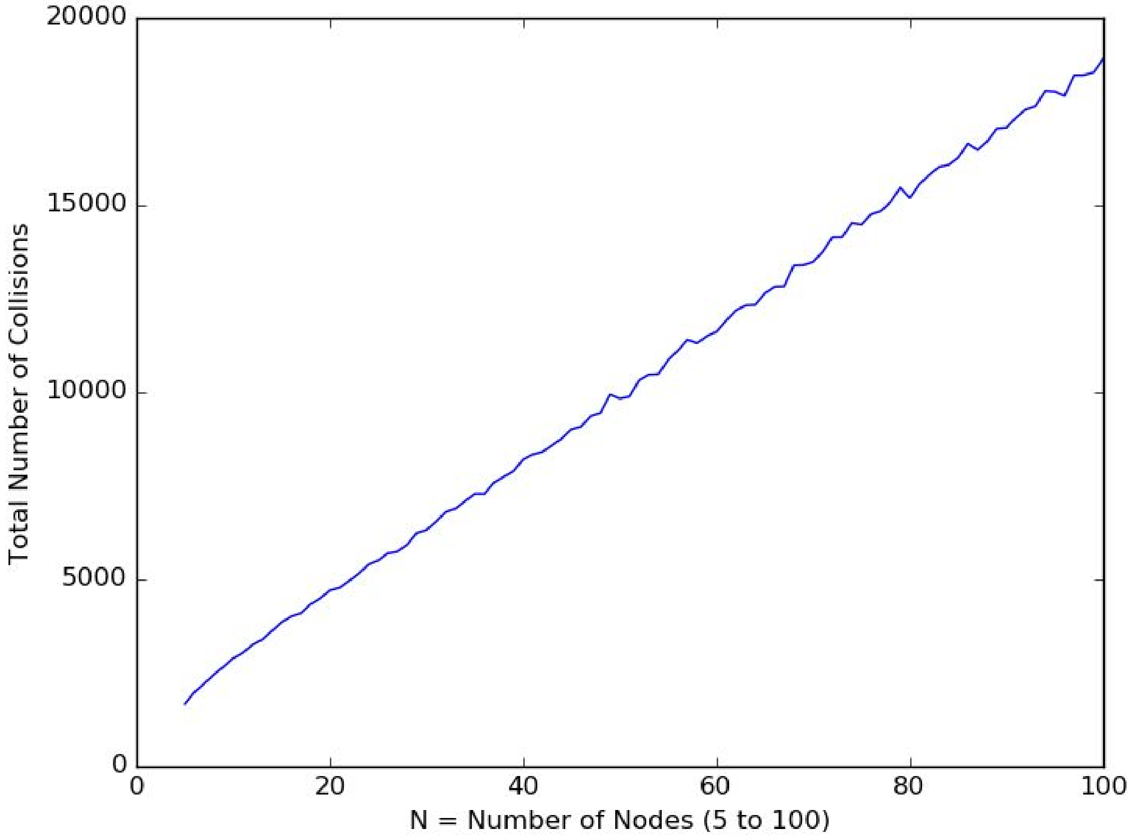
What we can see from this is that as the number of nodes on a network goes up, the channel utilization goes down as much as 16% (on this ideal channel). We can also see that on this channel the ideal number of nodes is around 10-20.

b. Channel idle fraction vs. number of nodes:



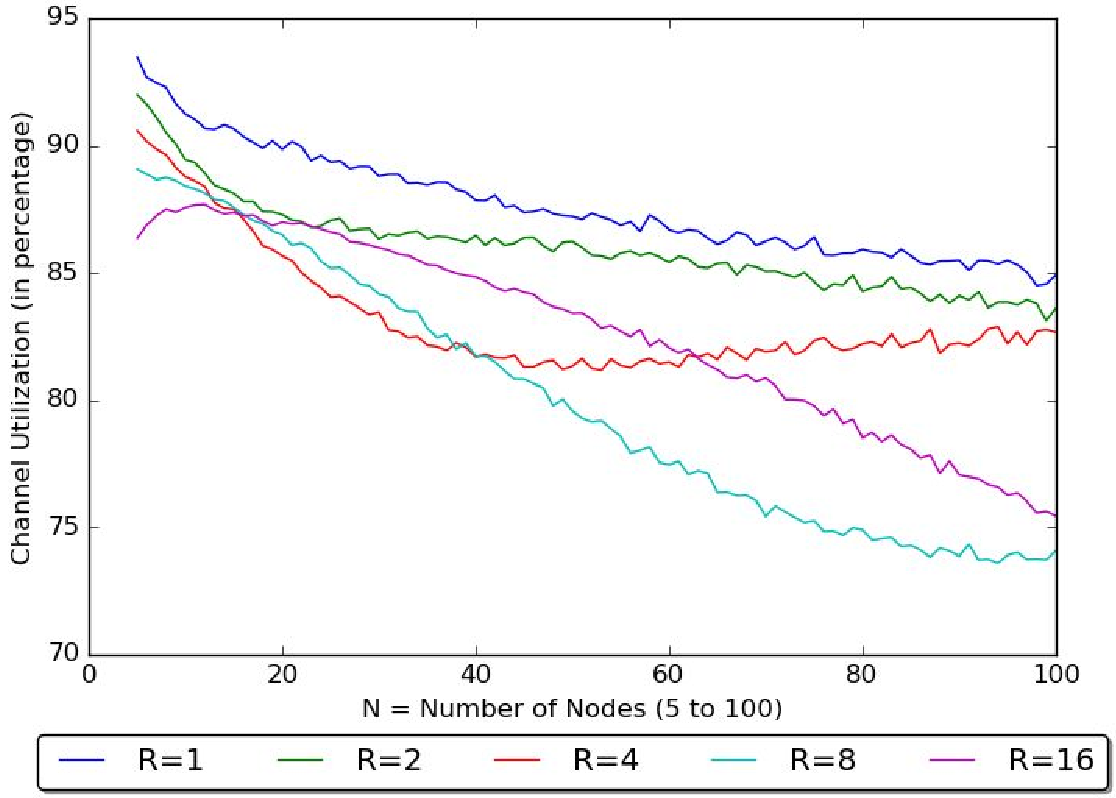
Note that this graph shows what we would expect, something approximately opposite to the graph in part (a). This also suggests that collisions are occurring much more frequently because higher idle time suggests higher backoff times, which happens from collisions. Also, it's interesting to note that initial drop off in N<20. Since in (a) the utilization doesn't change, this suggests that more nodes are trying to use the channel until collisions happen frequently enough, which significantly increases the backoff time.

c. Plotting total collisions vs. number of nodes:



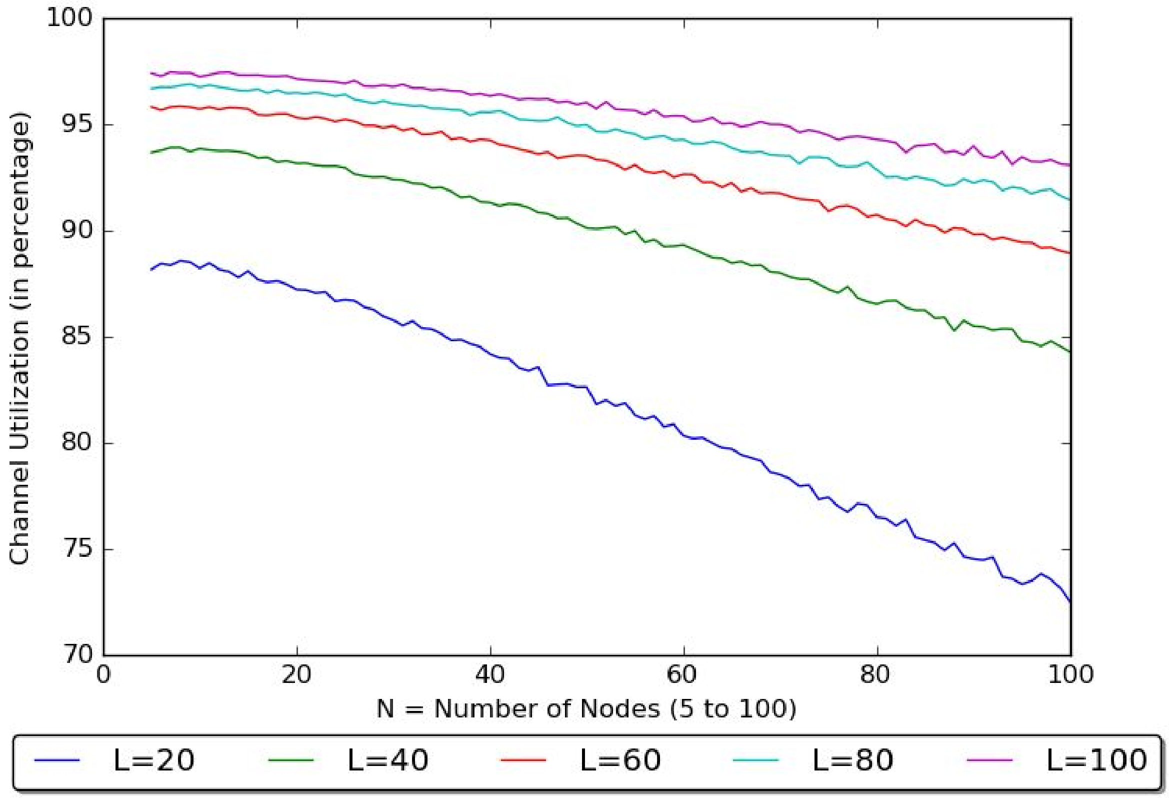
This confirms our expectations precisely. As the number of nodes increases, so too does the number of collisions.

d. Experimenting with different initial backoff values:



It seems like we have better behavior with lower R values. This is perhaps due to having a lower upper-bound on the backoff timer. However, some of the decaying percentages suggest that the number of collisions becomes saturated and in general packets drop at a more constant rate. This, however, is less true with higher R values like R=16 because of a much higher upper-bound on the backoff timer, which would cause enormous backoff times and very low utilization rates.

e. Experiments with different packet lengths:



This graph makes perfect sense. Since there is no usurpation, assuming that nodes are just as likely to get to use the channel a longer packet size would mean that the channel will be used for longer per packet.

f. Just to reiterate what was already noted in (d) and (e), with decreasing values of R, it's more likely that one node will usurp quickly. In fact, it's very likely that that one node will be able to hog the channel. This suggests high utilization, but in all likelihood it's not a good scheme because of this channel hogging phenomenon. The same sort of thing happens with higher packet lengths. We once again have higher utilization, but that's only because each node hogs the channel for longer. So while the graphs in (d) and (e) suggest having a low R value and a high L value are good, it's likely the case that these are unfair cases and should be discouraged. Furthermore, in general, it should be noted that as N increases, across all the graphs in general utilization decreases after a certain point, suggesting that there exists a tipping point to maximize utilization.