MP4 Report

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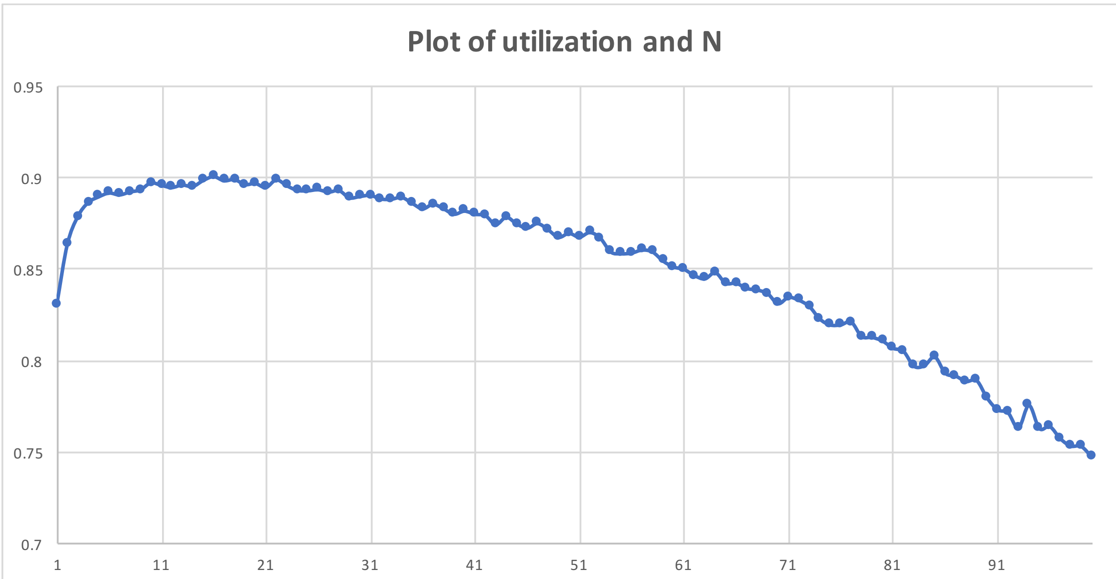
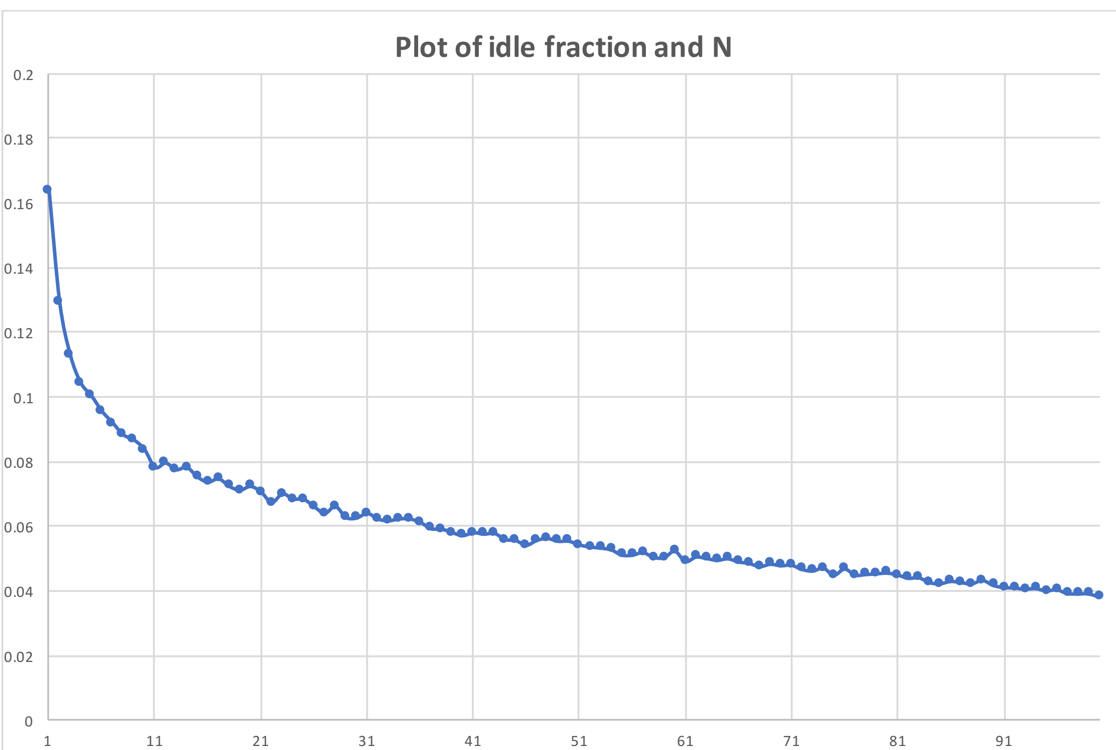
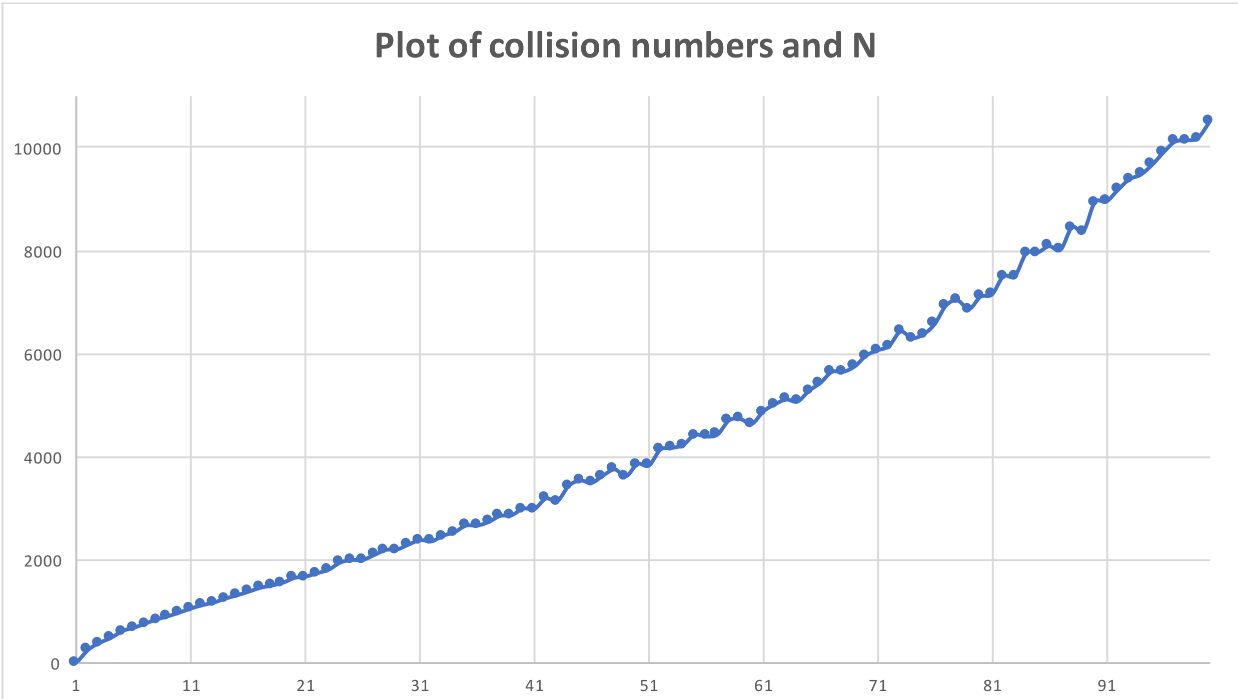
(a)



(b)

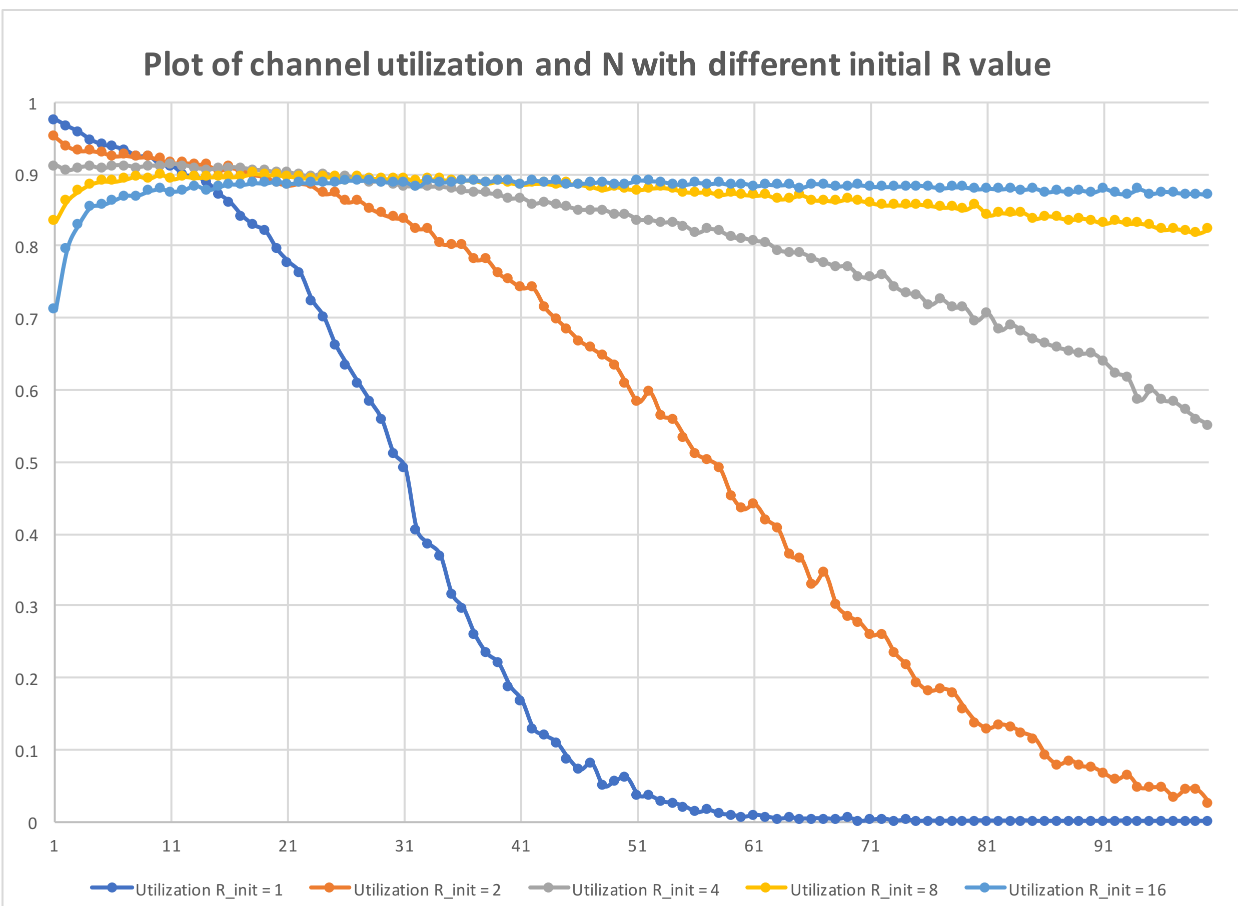


(c)



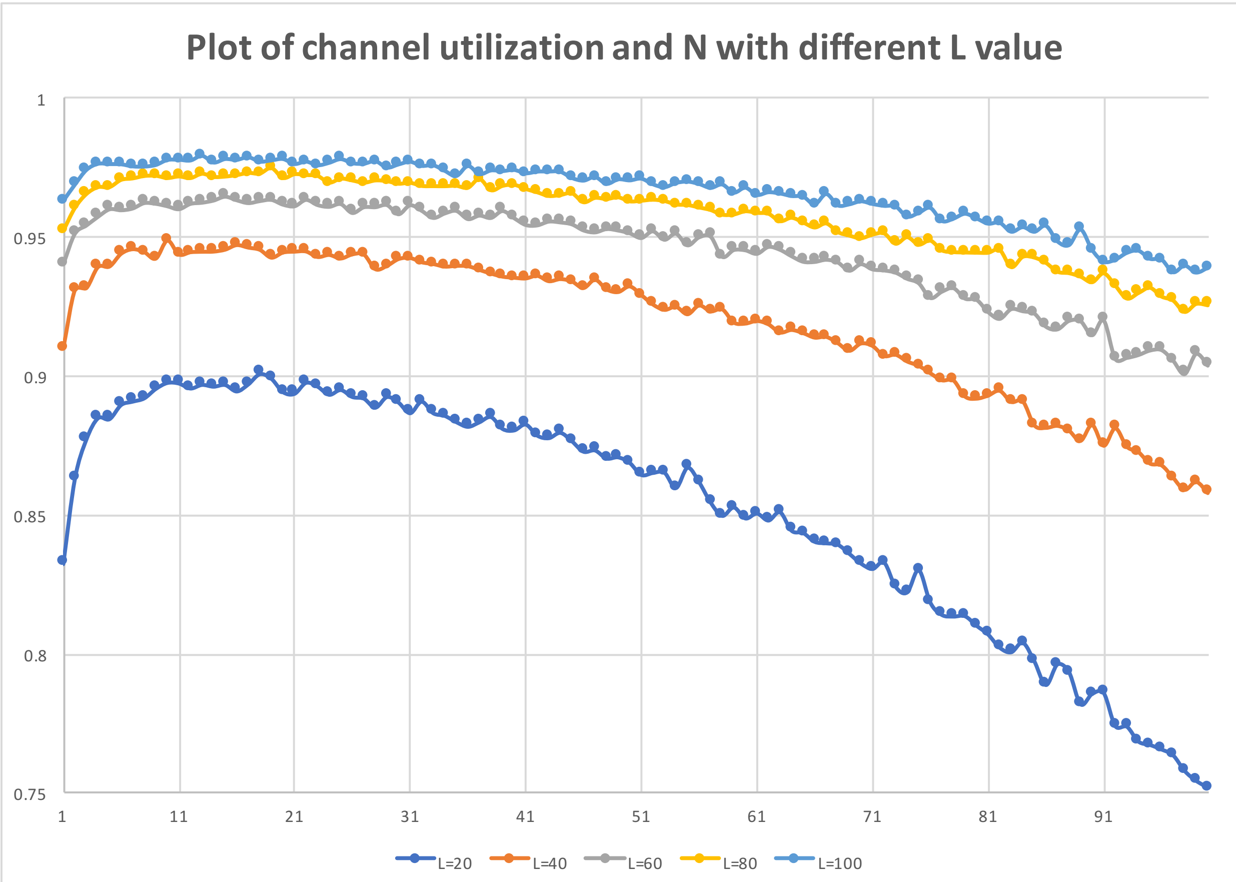
Plot of collision numbers and N
10000
8000
6000
4000
2000
0
1
11
21
31
41
51
61
71
81
91

(d)



Plot of channel utilization and N with different initial R value
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
11
21
31
41
51
61
71
81
91
Utilization R_init = 1
Utilization R_init = 2
Utilization R_init = 4
Utilization R_init = 8
Utilization R_init = 16

(e)



(f)
For graph(d), we noticed that the collision chance is proportional to the ratio N/R_init when N is relatively large, say N > 15. This is because since R range is fixed which is from R_range_min = 0 to R_range_max = (R_initial*2^4). But N range is from 0 to infinity. Based on the pigeon-hole theory, the hole number is fixed (R_range), while the pigeon number(N) is increasing, the chance to have collision is increasing which results in that the utilization is decreasing.

When N is relatively small, the collisions become rare but the countdown process (idle time) becomes the major reason for lowering utilization. As a result, we can see from the graph that the larger R_init is, the lower utilization is.

For graph(e), we can see the same trend as in graph(d), while the N is increasing, the channel utilization shows a decreasing trend. The reason is the pigeon-hole theory as well. We also notice that for the same N, the higher L is, the higher utilization is. The reason is since during the transmission, the channel is fully utilized. The longer the transmission goes, the higher the utilization is. Therefore, say if we only have 101 iterations and we have at least one packet been successfully transmitted, then for L = 100, we would have at least 100 iterations that the channel is fully utilized but for L = 20, in order to reach the same utilization as L = 100, we need to have 5 consecutively successful transmissions, which is relatively less possible.