COMPENG 4DK4 LAB4

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# Experiment

## 2.

The obtained graph is shown below when the number of stations is 10 and the mean back off duration values are 5,10 and 20. The below shows the mean delay vs arrival rate between 0.1 and 0.7 incrementing by 0.01. As the arrival rate approaches 0.07, the mean delay when the back off duration value is 5 starting to become very large (infinite).



The obtained graph is shown below when the number of stations is 5 and the mean back off duration values are 5,10 and 20. The below shows the mean delay vs arrival rate between 0.1 and 0.7 incrementing by 0.01. As the arrival rate approaches 0.09, the mean delay when the back off duration value is 5 starting to become very large (infinite).



In conclusion from both graphs, we can see when the value of back off duration is lower. The mean delay will be lower. However, when the arrival rate increases till some points, the mean delay of the lower back off duration time will start becoming very large(infinite) which means the system is insufficient to support the retransmission with that back off duration time.

And when the number of stations decreases, the marginal arrival rate compare to higher number of stations where the mean delay starts becoming infinity is larger. This is reasonable as more stations will have more retransmissions happen when the arrival rate starts increasing.

## 3.

To achieve the binary exponential backoff, we can simply change the following line as shown below.



It will set the backoff duration uniformly in the range [0,2^Nc) where Nc is the number of collisions that the packet has suffered.

And we can compare the results from part 2. The new plots are shown below.





As we can see from both graphs, by using the binary exponential backoff will not provide us the minimum average mean delay. However, by using the binary exponential allow us to adapt dynamically based on the number of collisions which it will significantly reduce the chance of repeated collisions. Compare to the fixed mean backoff, there is not a threshold arrival rate for the binary exponential backoff which may cause the system result an infinite mean delay.

By extending the throughput input(arrival rate) to 0.5, we can further prove our conclusions, as we can see below, the fixed mean backoff duration will reach a threshold value and starting increasing the mean delay value extraordinary while the binary exponential backoff will try to adjust itself to decrease the mean values.



## 4.

To modify the simulation from Part3 so that only one particular station will always retransmit an unsuccessful packet in the very next slot. We can modify the code as shown below. In this code, I set that particular station equals to station number 3. And when it detects the channel transmission is unsuccessful, it will then detect where this unsuccessful packet is coming from which if the packet is coming from the station number 3, it will schedule the retransmission immediately and there will be no backoff at all.

A screen shot of a computer program

Description automatically generated

After run several simulations, I found that for that particular station channel 3, the mean delay is relevant low compare to other stations mean delay, this is reasonable since we have assigned the channel 3 will retransmit immediately if it fails.

One of the example is showing below when the arrival rate is 0.1 and the number of stations is equal to 10 and 5.

 

Table Number of stations = 10, packet arrival rate = 0.1 Table 2 Number of stations = 5, packet arrival rate = 0.1

## 5.