Topics in Networks
Assignment

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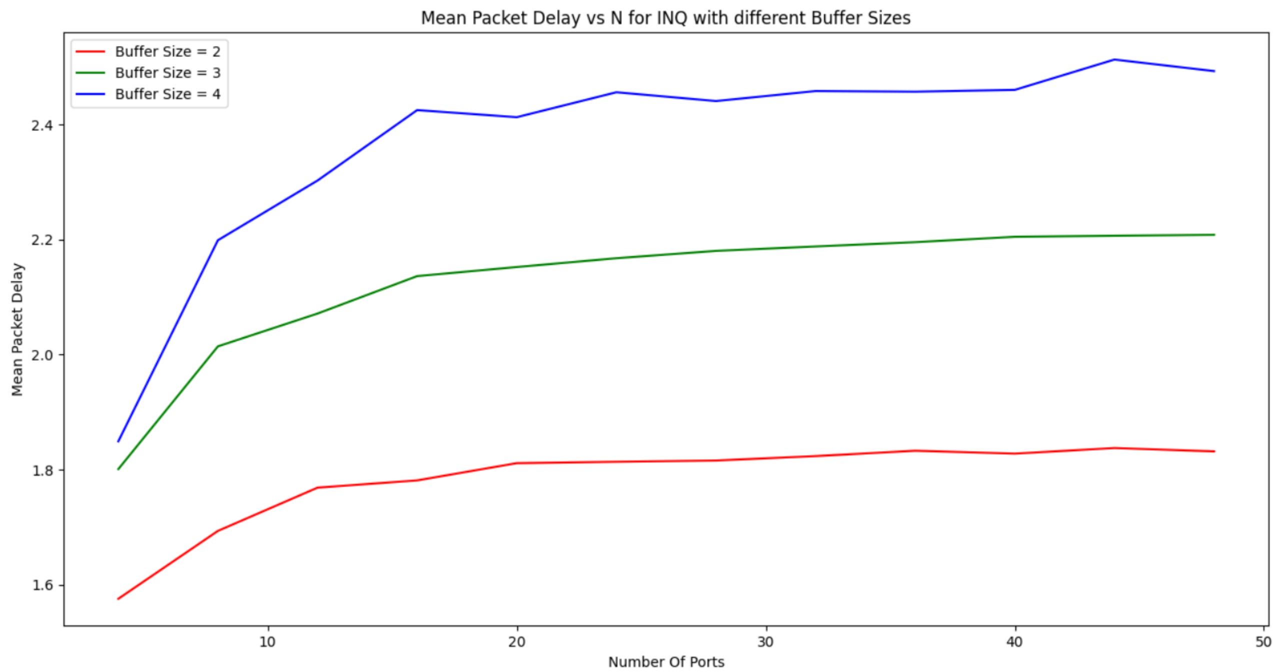
The following plots have been created with the value of p assumed to be 0.5
Performance Graphs:-

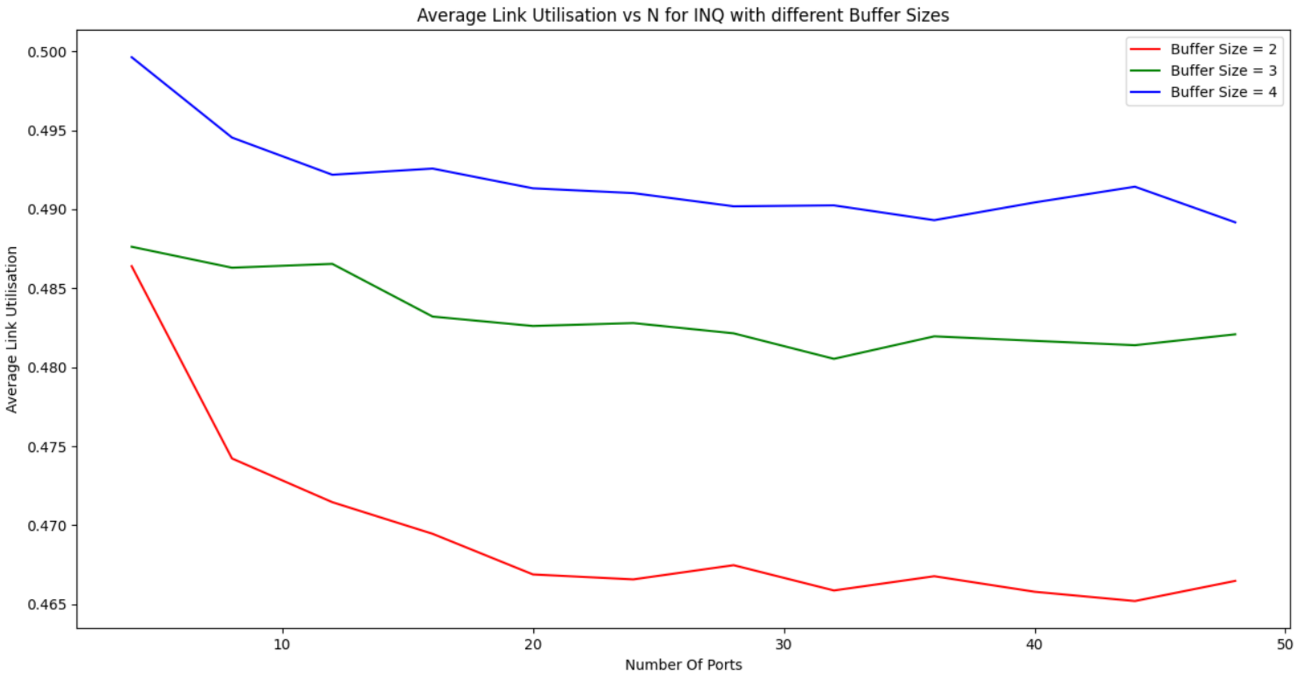
INQ:-
In INQ scheduling at the beginning of every time slot we look for the destination ports of the packets at the head of every input port and if there is any contention, we choose one of the packets randomly and send it while the other contending packets are forced to wait. Otherwise if there is no contention we directly send the packet to the corresponding output port.

Mean Packet Delay vs N with different Buffer Sizes



As we can see the mean packet delay increases with increase in buffer size, this happens because due to larger buffer size more number of packets are affected by HOL blocking. Also increasing the number of ports increases the number of packets thus the effect of HOL increases and hence mean packet delay increases.

Average Link Utilisation vs N with different Buffer Sizes

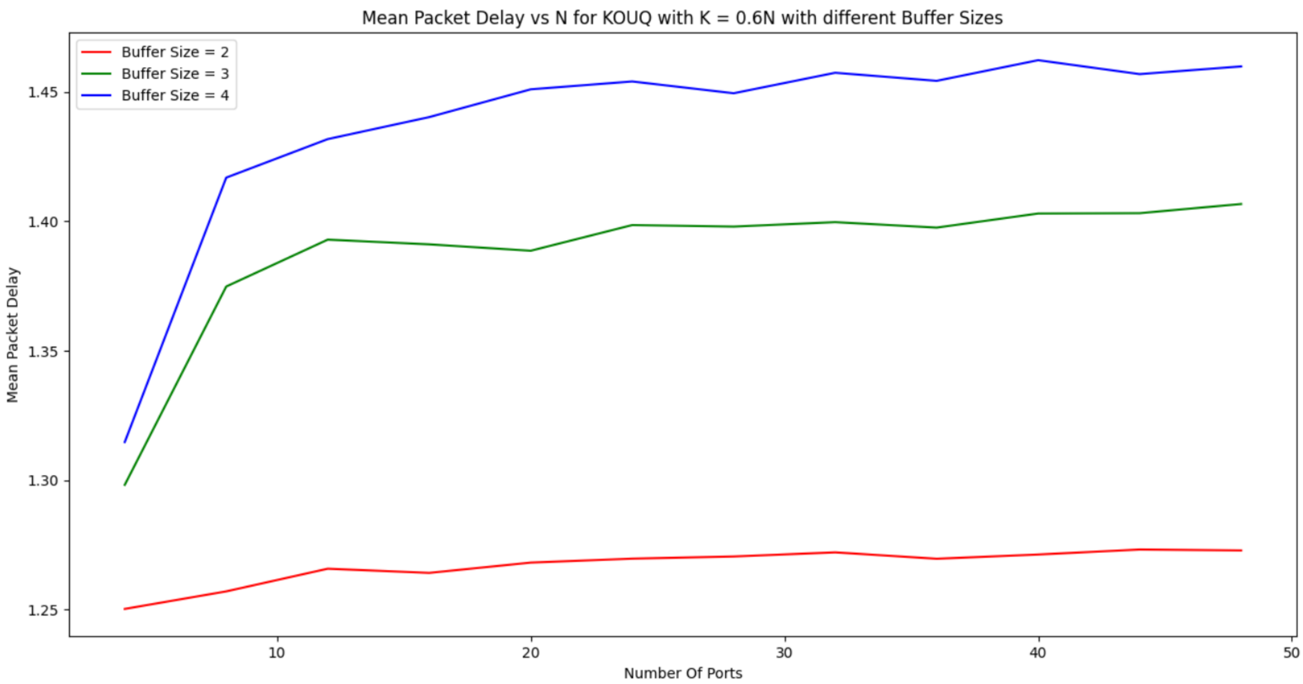


As we can see average link utilisation increases with increase in buffer size this happens due to decrease in number of packets getting dropped. Also since increasing the number of ports indirectly increases HOL blocking the average link utilisation decreases.

KOUQ:-

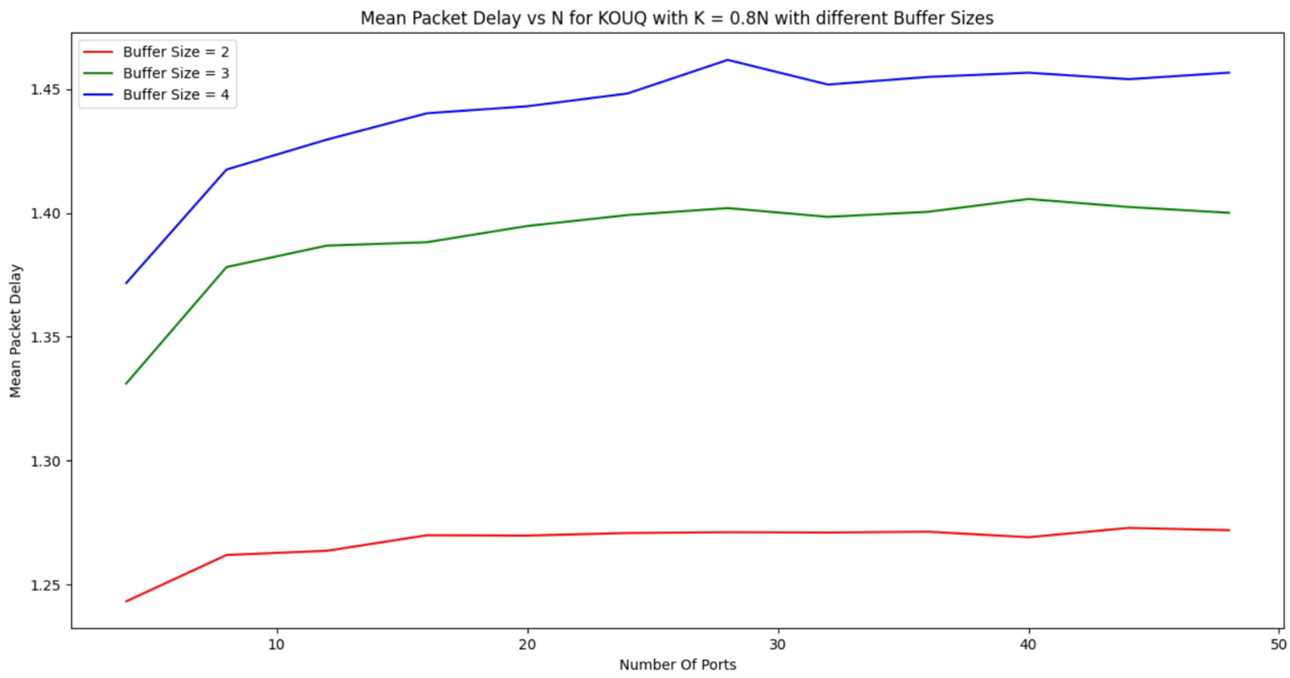
In KOUQ scheduling at the beginning of every time slot we look for the destination ports of packets at the head of every input port and for each output port if there is contention we choose K (if number of packets contending is less than K then we send all of them) of the contending packets randomly and send them to the output port buffer while the remaining packets are dropped.

Mean Packet Delay vs N with K = 0.6N with different Buffer Sizes



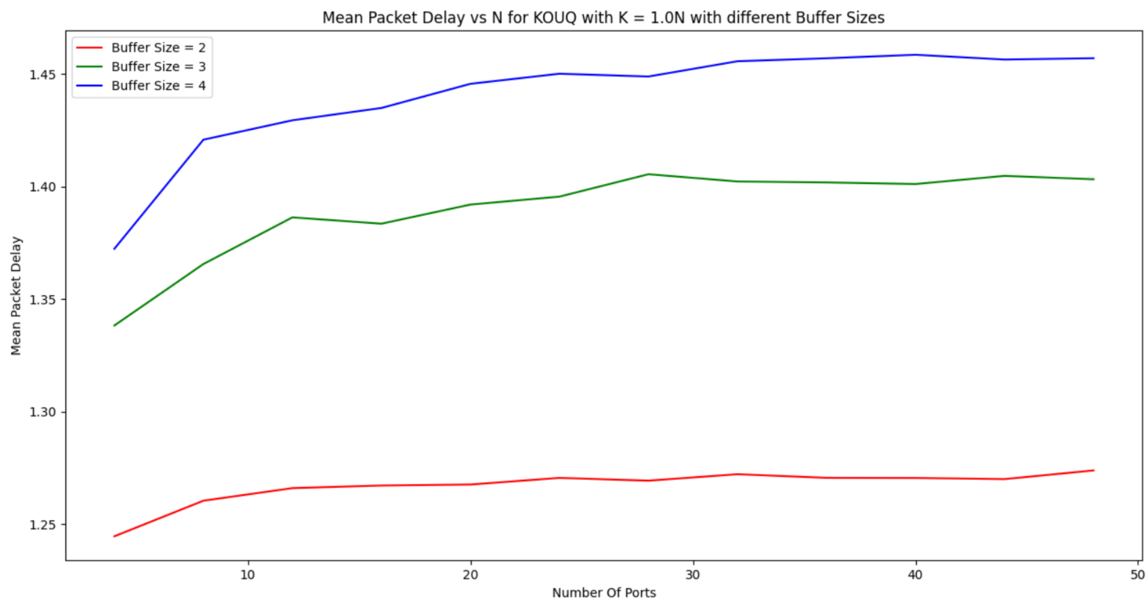
As we can see the mean packet delay increases with increase in the buffer size this happens because the the number of packets waiting ahead of a given packet in the output port when it arrives increases on an average thus it has to wait for a longer duration to get transmitted from the output port buffer. There is a slight increase in packet delay with number of ports because it causes a slight increase in number of packets that are forced to wait for longer durations due to which there is a steady increase in packet delay.

Mean Packet Delay vs N with K = 0.8 N with different Buffer Sizes



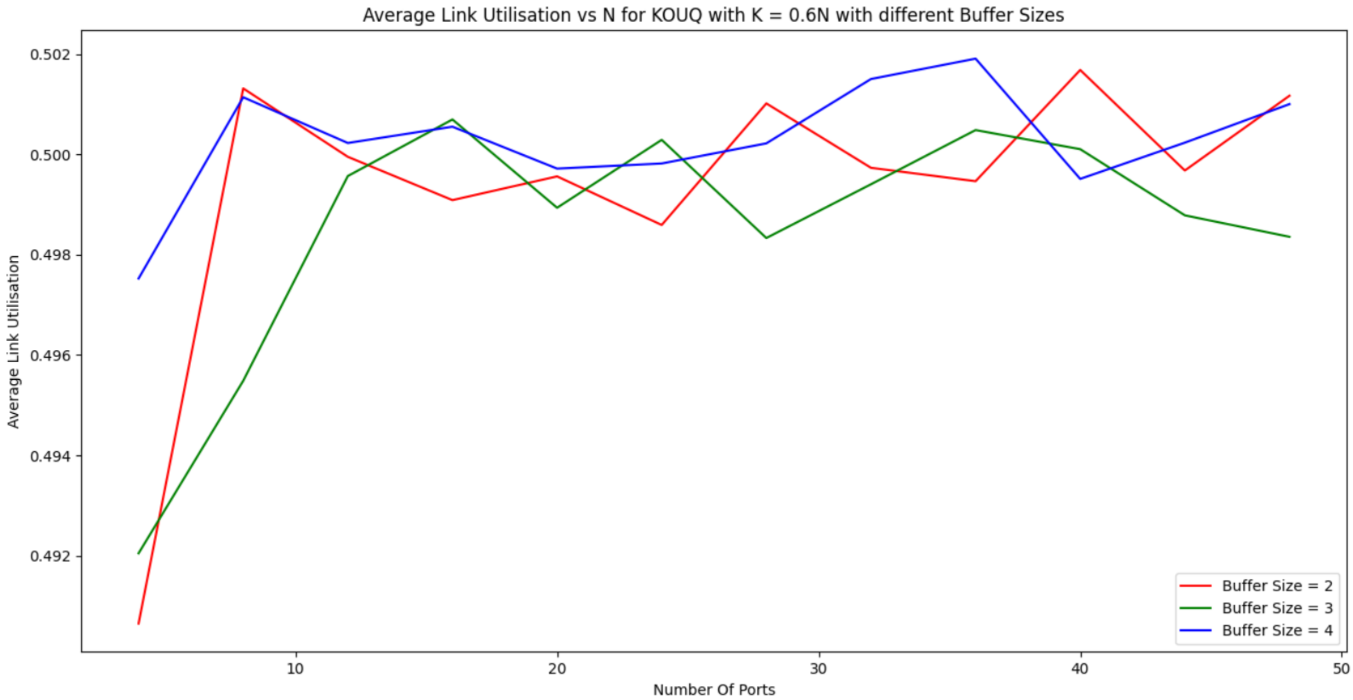
The trend is similar as in the case of K=0.6N this is because 0.6N is larger than the buffer size for larger values of N so it doesn't make much of a difference if K is set to 0.8N as the number of packets entering the output buffer and and hence contributing to the average packet delay are bounded by buffer size and not K

Mean Packet Delay vs N with K = 1.0N with different Buffer Sizes



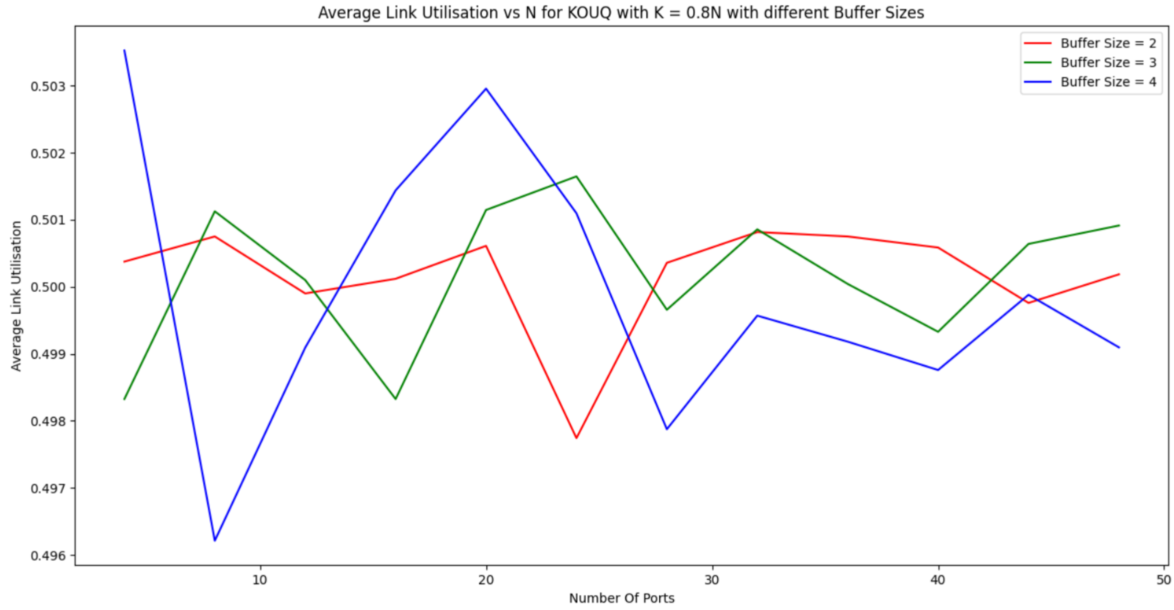
The trend is similar as in the case of K=0.6N and K=0.8N and the reasoning is the same as given above.

Average Link Utilisation vs N with K = 0.6N with different Buffer Sizes



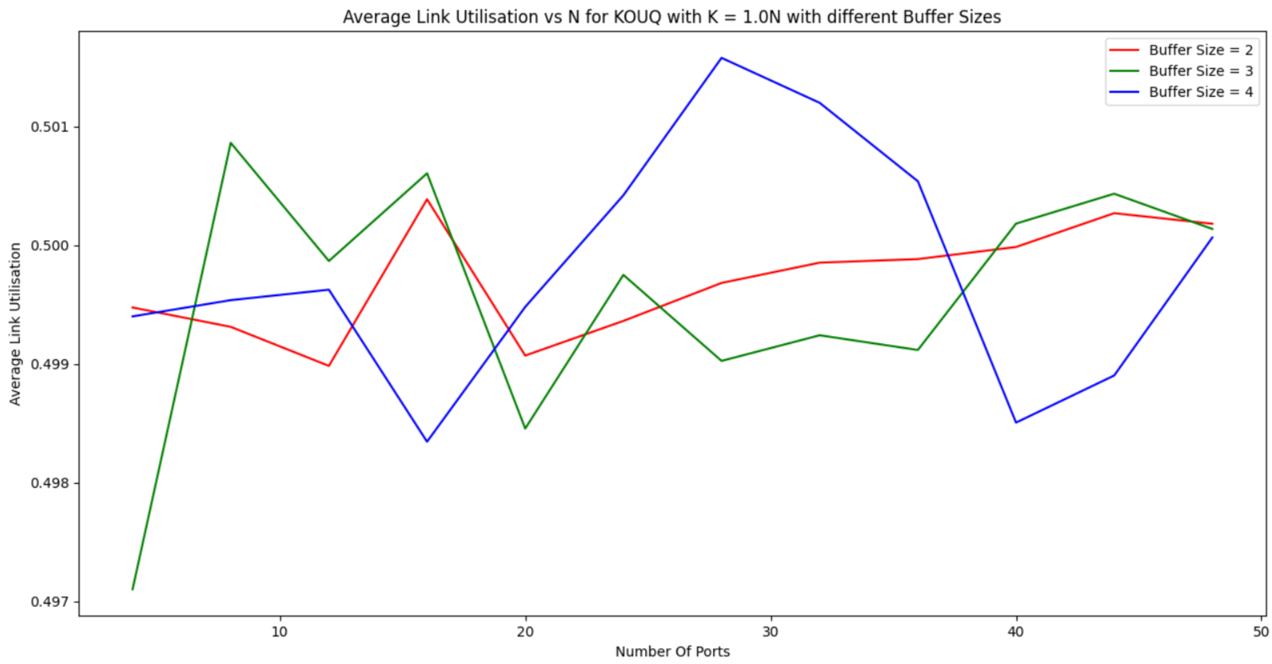
The average link utilization differs very slightly with increase in buffer size. This happens because the increase in buffer size only affects the output ports as the packets that are not among the chosen K for each output port are anyways dropped in a given slot so the scenario is similar to that when there is no input queues . The average link utilization differs very slightly with increase in N as K also increases in proportion.

Average Link Utilisation vs N with K = 0.8N with different Buffer Sizes



The trend is similar to K=0.6N case because KOUQ sends K packets out of the packets contending for the same output port and the probability that the number of packets contending for same output port exceeds 0.6N is very very less so even when we increase the K to 0.8N the scenario where it helps is occurring very very rarely thus there is hardly any increase in the average link utilization.

Average Link Utilisation vs N with K = 1.0N with different Buffer Sizes

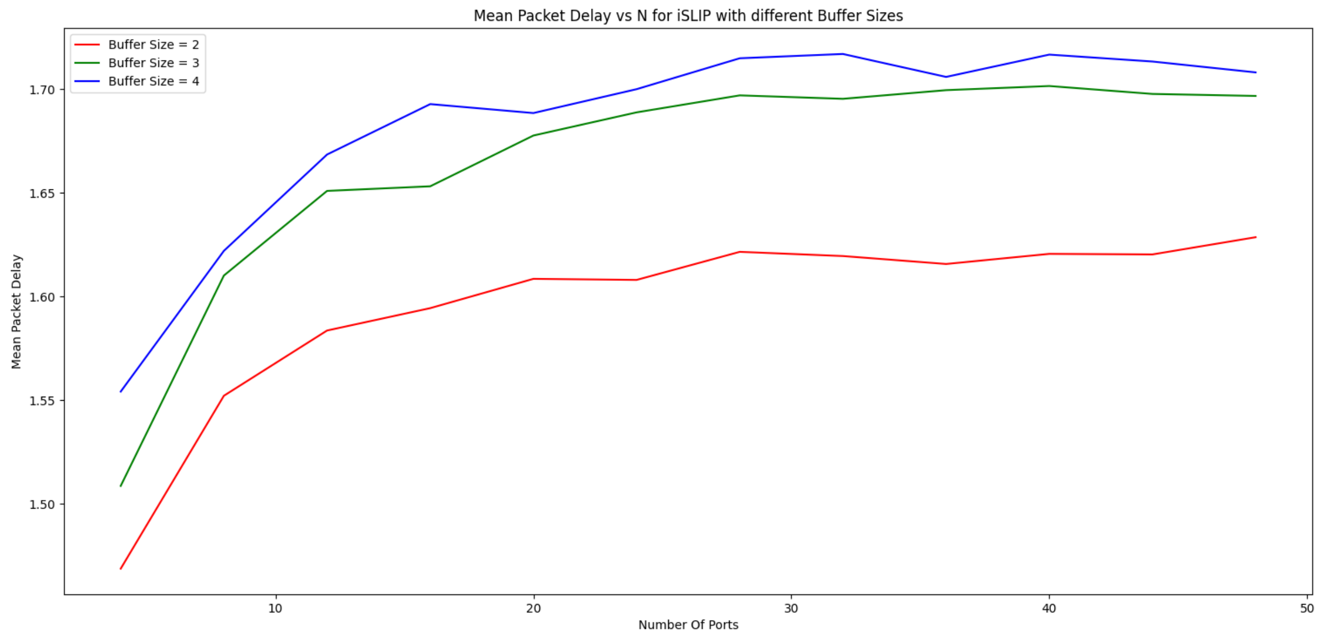


The trend is similar to K=0.6N case because KOUQ sends K packets out of the packets contending for the same output port and the probability that the number of packets contending for same output port exceeds 0.6N is very very less so even when we increase the K to 1.0N the scenario where it helps is occurring very very rarely thus there is hardly any increase in the average link utilization.

iSLIP:-

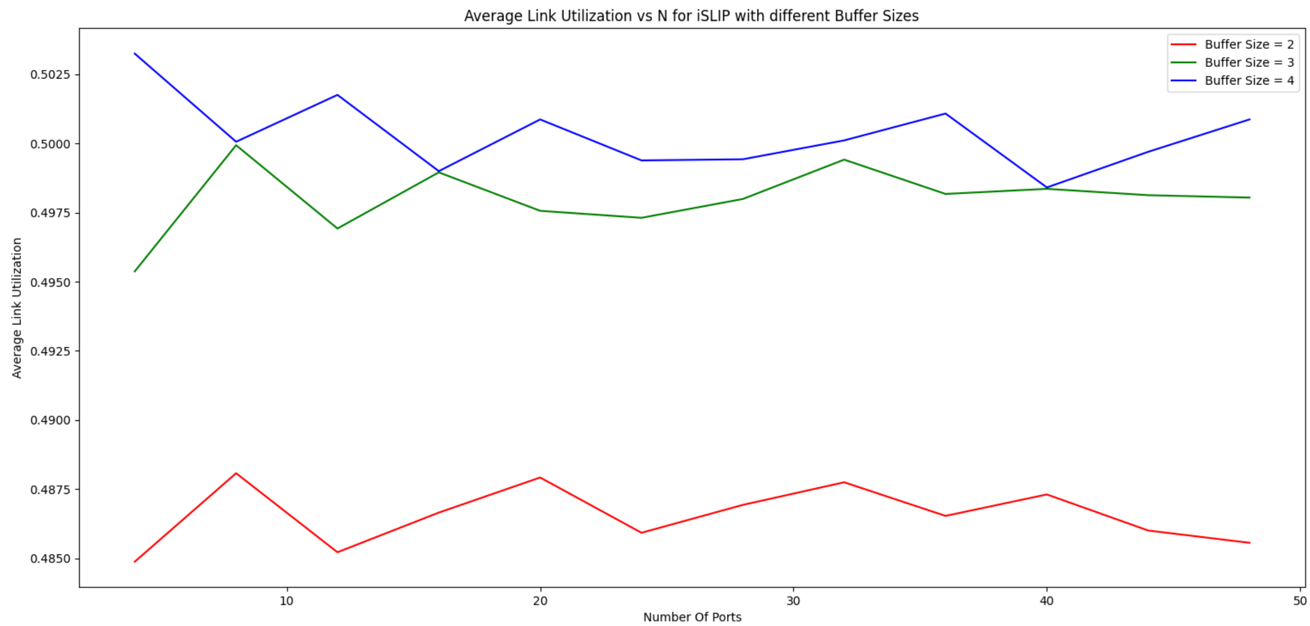
In iSLIP scheduling the algorithm is similar to the Round Robin Matching Scheduling but with some changes. The key differences are that the updation of pointers on the output ports happens only after acceptance from some input port unlike RRM where the update happens after grant phase and also unlike RRM where updation pointers happens in every iteration, in iSLIP the updation of pointers happens only in the first iteration of the algorithm while in the subsequent iterations the pointers and the round robin priority order freezes, the algorithm is guaranteed to terminate in N iterations where N is the number of input/output ports.

Mean Packet Delay vs N with different Buffer Sizes



As we can see the mean packet delay increases with increase in the buffer size this happens because the the number of packets waiting ahead of a given packet in the output port when it arrives increases on an average thus it has to wait for a longer duration to get transmitted from the output port buffer.. The mean packet delay increases with increase in number of ports.

Average Link Utilization vs N with different Buffer Sizes



The average link utilization increases with increase in buffer size since the number of packets dropped decreases. The average link utilization doesn't show any specific trend with increase in number of ports.

Conclusion:-

Mean Packet Delay - KOUQ is the best followed by iSLIP followed by INQ
Average Link Utilization - KOUQ,iSLIP,INQ have roughly similar performance for p = 0.5 although running the code from p=1 gives almost 100% utilization for KOUQ and iSLIP while INQ is capped at around 60%.