CS6040: Router Architecture and Algorithms

Semester: Jul-Nov 2024

Assignment 3 Report

Packet Switch Queueing

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1 Introduction: Packet Queueing in Switches

2 Challenges

3 Experiment

4 Variables of the Experiment

4.1 Packet Generation Probability p

Each input port generates a packet in a time slot with a Bernoulli(p) distribution.

4.2 Buffersize B

Each input and output can hold upto B packets

5 iSLIP Algorithm

5.1 Algorithm

5.2 Time Complexity

5.3 Salient Features

6 Results

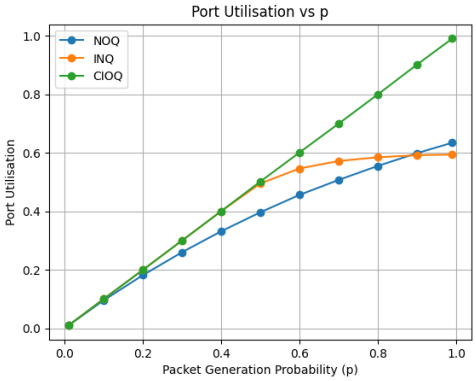
The above figure compares the link utilisation, drop probability and waiting time for the different algorithms with default parameters. For CIOQ, $K = 4$ and $L = 6$ was chosen.

6.1 Utilisation

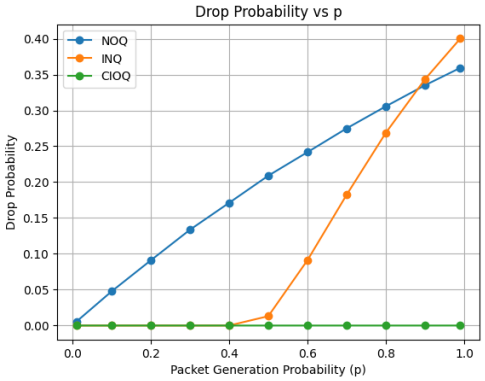
From the figure we see that iSLIP algorithm has the best utilisation and increasing linearly with the increase in probability. As derived in class, we see that NOQ has a saturation utilisation of 64% while INQ can only have a maximum utilisation of 58.6%. One important insight from this is that although NOQ outperforms INQ, at lower loads, the INQ gives a much better utilisation than NOQ.

6.2 Drop Probability

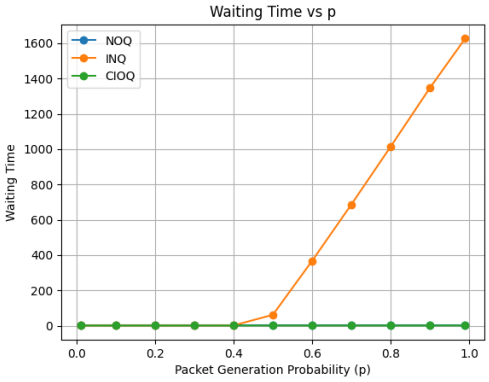
CIOQ with iSLIP algorithm has as a consistent nearly 0 drop probability, whereas NOQ and IOQ have drop probabilities reaching to upto 40% for $p = 1$. Again, here INQ



(a) Utilisation



(b) Drop Probability



(c) Wait Time

Figure 1: Comparing the different Queueing algorithms

outperforms NOQ under low loads, but becomes worse under higher loads.

6.3 Waiting Time

The waiting time for NOQ and CIOQ is consistently 1 time slot. But for INQ, the wait time increase approximately linearly after $p = 0.5$, and reached a maximum of 1600 time slots. Thus, considering waiting time as the metric, NOQ and CIOQ are preferred.

7 Conclusion