**CS-6040**

**ASSIGNMENT 3**

**TECHNICAL REPORT**

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**Performance of Queuing:**

1. NOQ
2. CIOQ
3. NOQ:

NOQ means no queueing or no buffers are going to be used.

1. CIOQ:

Combined Input-Ouput Queueing. Both input and ouput buffers were used.

**IMPLEMENTATION:**

Both NOQ and CIOQ contained three phases.

1. Traffic Generation
2. Scheduling
3. Tranmission

A)Three threads were were created I.e. one for each phase. In Traffice Generation and Tranmission, in turn nested threads were created. If

There are n input and n output ports, then n internal threads were created in traffic generation and n internal threads in transmission phase.

B) Scheduling was the core part. In NOQ, scheduling was direct.

In CIOQ, Parallel Iterative Matching was used, in order to make utilization maximum and minimize the output contention in each slot.

1. The algorithm used for implementing was Maximum Bipartite Matching. As, if first L slots were considered then there were L\*N

Packets, out of which N should be transmitted in one slot.

The backplane speed should be N times faster than the input line rate.

1. So, from any input queue, L packets can go to any of the output queues, this can be stored as a graph.

The graph data structure was implemented as Adjacency Matrix.

E)So the goal was to maximize the matching. Matching means making

the connections in the graph such that no edges were adjacent.

1. The PIM technique will maximize the efficiency as it would try to minimize the output contention.

1. The space complexity and time complexity for PIM algorithm is O(N^2)when number of input ports and output ports are equal to N.
2. Now, as there are k servers in each output port i.e. there are k buffers in each output port. So, the input ports where there is output contention, we can forward the packets into the output queues whose servers or buffers are empty.

**RESULTS:**

1. Experiment reading proves that CIOQ performs much better than

NOQ, as average output port utilization in NOQ is around 40% and

CIOQ ‘s average output port utilization in CIOQ is around 75%.

1. Average packet delay is fixed in NOQ which is 1 unit. Average packet delay in CIOQ is around slightly greater than the number of buffers in the input queue.
2. For around L = K = 0.7\*N, experimental analysis shows us that average port utilization is maximum,

**VISUALIZATION:**













































