A Comparative Study of Scheduling Algorithms in Virtual Output Queuing
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Scope
The scope of this project is to study and compare the existing maximal matching algorithms currently available, based on the following three criteria: performance, complexity, hardware implementation. During the course of the project, we will also look for opportunities of original research.

Introduction
In a crossbar switch, multiple packets for the same output can arrive at the same time so queuing has to be done either on inputs or on outputs. Most often, packets are queued at the input to achieve more throughput and ease of implementation in hardware. If simple FIFO queues are used at inputs, then throughput is limited due to Head of Line (HOL) blocking. HOL can be overcome by maintaining separate queues for each output. A fair scheduling algorithm is needed to connect inputs with outputs at particular timeslot. Throughput, performance and input queue starvation is directly linked with the scheduling algorithm.

Related Work
The scheduling problem can be represented as finding maximum matching in bi-partite graphs where all inputs represent one part of the graph and outputs represent second part of the graph (Fig 1).

![Graph](image)

Fig 1: Scheduling problem is matching problem in graphs

A number of algorithms have been tried to solve matching problem in input-queued switches such as Weighted matching algorithm, Neural network algorithm, Parallel iterative matching, iSLIP, Pipelined maximal size matching, and symmetric crossbar arbitration, two dimensional round-robin schedulers. These algorithms help to design and develop very high speed and cost effective switches for the networks.

Project Agenda
In this project, we will be studying all of these algorithms and provide a comparison between these approaches in terms of performance, throughput and starvation free queues for uniform and non-uniform data. There are some other algorithms to solve matching problems in bi-partite graphs. We will also study them to see which of them can be implemented in hardware and performance can be improved.

Deliverables
Mid Term Report will be submitted on April 5, 2004. It will comprise a set of summaries of all the work that we would have read by that time. A review of all algorithms to solve matching problem in virtual output queuing. A comprehensive survey of all the work done in the scheduling of input-queued switches in Computer Networks and other algorithms to solve matching problem in graphs in the area of Theoretical Computer Science will be submitted on May 7, 2004. We will also be interested in giving a presentation at the end of the course.

Goals and Objectives
Understand the work done in scheduling in input queued switches.
Evaluate the algorithms to solve matching problem in bi-partite graphs for possible avenues of future research.
References
[10] N. McKeown, A. Mekkittikul, A Practical Scheduling Algorithm to Achieve 100% Throughput in Input-Queued Switches, INFOCOM 98