Name: Jikai Li
E-mail address: jikaili@cse.buffalo.edu
<mailto:jikaili@cse.buffalo.edu>
Dissertation Proposal Title: Proactive Burst Contention Avoidance Scheduling Algorithms for Labelled Optical Burst Switching Networks
Committee:
Chair: Chunming Qiao
Members: Xin He, Jinhui Xu
Dissertation Proposal Abstract:

It is widely believed that Optical communication is the only solution that can, in the long-term, cost-effectively meet the increasing demand for bandwidth in long-haul and metropolitan networks. Recently, several optical network paradigms have been under intensive research. Of all these paradigms, optical circuit switching is relatively easy to implement but lacks flexibility to cope with the fluctuating traffic and the changing link state; Optical Packet Switching (OPS) has been regarded as the Holy Grail, but the required optical technologies such as optical buffer and optical logic are too immature for it to happen anytime soon. A new approach called Labelled Optical Burst Switching (LOBS) that combines the best of optical circuit switching and optical packet switching was proposed and has received increasing amount of attention from both academia and industry worldwide.

Future data and transmission networks will consist of elements such as routers, Time-Division Multiplex (TDM) switch, optical cross-connect (OXC) switch and Labelled Optical Burst Switch (LOBS) etc., that will use Generalized Multi-Protocol Label Switching (GMPLS) to dynamically provision resources under the guideline of Traffic Engineering (TE). Of all the TE objectives, low burst loss rate is a major concern in LOBS networks. The reason lies in the fact that LOBS network has no buffer at core nodes. Most recent researching activities have revolved around the burst loss problem, and many schemes were proposed to reduce loss rate. Generally speaking, all these schemes can be classified into two categories. One category is reactive method, which tries to resolve the burst contention or minimize the loss incurred by burst contention. Almost all existing schemes belong to this category. They include deflection algorithms, FDL organization and scheduling algorithms, segmentation algorithms etc. The other category is proactive method that tries to avoid possible burst contention. So far, only one such algorithm exists, which is called Priority-based Wavelength Assignment (PWA). However, PWA is meaningful only in LOBS networks without wavelength conversion capability. In this work, we propose several novel algorithms for scheduling burst in LOBS networks with and without Fiber Delay Lines(FDLs) or wavelength conversion capability. Our algorithms try to pro-actively avoid burst contention at remote (downstream) nodes. The basic idea is to serialize the bursts on outgoing links to reduce the burst overlapping degree (and thus burst contention and burst loss at downstream nodes). This can be accomplished by judiciously delaying locally assembled bursts beyond the pre-determined offset time using the electronic memory available at the ingress nodes. It can also be applied in the core by delaying transit bursts using fiber delay lines (FDLs) even though there is no contention without using FDLs at all or a smaller

delay is sufficient to avoid contention at this intermediate node. Preliminary results show that the loss rate of our proposed algorithms is much lower than the existing algorithms.