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A Photonic Container Switched OBS Architecture with Non-preemptive Centralized Scheduler for the Core Transport Network

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Abstract. We propose a new high-level OBS architecture based on *photonic container switching* to be deployed in the core network. Our architecture removes most of the complexities of the present day Optical Burst Switching (OBS) technology and makes possible an all-optical core network with zero packet loss guaranteeing equal QoS to all users. In the proposed architecture, the packets are actually packed in fixed size containers which will be converted into an optical burst and transmitted through the network. A major challenge in our architecture is the centralized scheduler design that ensures zero packet loss and no optical-to-electrical switchings in the intermediate nodes. We present a novel divide and conquer algorithm for the scheduler design problem based on non-preemptive scheduling techniques. We also provide numerical results ascertaining the efficiency and robustness of our algorithms under varying traffic conditions and network topologies.
Keywords: Network topology design, Optical Burst Switching, Scheduling.

1 Introduction

The major city hubs are currently interconnected at the core by optical transport using 40 Gbps optical links. Recent measurements of the Sprint Core router network revealed that most of the delay in the core network is the transport delay with very little attributed to packets waiting at the router queue. Thus the Quality of Service (QoS) management schemes for different services at the core routers are redundant as they have little effect on the transport delay. With this assumption, the core network becomes a pure transport network, similar to the airlines network with Hubs and Spokes mechanism where the Hubs are complete mesh connected with very low cost, high capacity transport vehicles. This conclusion leads us to the exploration of technologies that can provide a very low cost high capacity transport network in the optical domain. The most promising technology in this area is *optical burst switching* (OBS) [1],[2]. OBS is a method for transporting traffic directly over a bufferless optical network and achieves a balance between coarse-grained circuit switching and finegrained packet switching. It also brings the following benefits:
1) OBS reduces the number of electrical to optical conversions, thereby reducing the cost