Abstract

Wavelength Division Multiplexing (WDM) networks are increasingly being deployed in both access and backbone networks, and thus, are becoming de-facto standard for high bandwidth requirements. However, all optical networks have inherent limitations due to non-availability of optical buffers and no-processing in optical domain. Both optical-buffers and optical-processing are, in general, required to provide differential quality-of-services (QoS) as demanded by different applications. However, both technologies are yet to mature for commercialization. Therefore, signalling mechanism is a possible solution to provide QoS. This thesis is an attempt towards QoS provisioning in WDM ring and optical burst switch backbone networks.

For WDM ring, we design a node architecture which is configured around a tunable transceiver (for data-channels) and a fixed transceiver (for control channel). We propose a medium access control (MAC) protocol for the node architecture; the protocol operates in three phases – reservation, transmission and release. We have shown, by simulation, that the node architecture is scalable and the MAC protocol is collision free. Then, we modify the proposed three-phase protocol, by eliminating the 'release' phase, to a two-phase protocol. We assume that the duration of transmission is known *a priori* and, therefore, release of the resources is implicit in the above two-phase protocol. To support priority-based QoS in WDM ring, the two-phase protocol and its associated node architecture is suitably modified. The proposed QoS scheme gives priority to node having high-priority request in reserving the destination node and data channel. A node having high-priority traffic can preempt the reservation request of low-priority traffic. We have shown that high-priority traffic experiences lesser delay then the low-priority traffic.

In optical burst switch (OBS) networks, burst-loss due to contention is a major issue. First, we propose a contention resolution scheme where the base offset time for all the bursts is taken to be the same. This proposed scheme which we call OBS-DoD (Delay-on-Demand) is shown to have lower burst-loss in comparison to the contemporary schemes. Next, we modify the OBS-DoD scheme to support prioritized and delay-constrained traffic. The modified scheme is called OBS-*Flex*. We have introduced a few additional parameters for contention resolution and QoS support in OBS-*Flex*. We have shown that the burst-loss in OBS-*Flex* is lesser along with meeting the QoS requirements.

We have used Poisson and Pareto traffic both for simulation studies.