

QUALITY OF SERVICE PROVISIONING IN WDM OPTICAL BURST SWITCHING NETWORKS

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Abstract

Optical Burst Switching (OBS) has been developed as an efficient switching technique to exploit the capacity provided by Wavelength Division Multiplexing (WDM) transmission technology for the next generation optical Internet. One critical design issue in OBS is how to provide Quality-of-Service (QoS) in optical networks.

This thesis focuses on providing QoS in OBS networks. Two basic models for QoS are considered: relative QoS and absolute QoS. In relative QoS, the QoS of one class is defined relatively to other classes whereas the absolute QoS model provides a worst-case QoS guarantee to support application with bandwidth constraints.

In order to provide relative QoS, this thesis presents buffer allocation algorithm to schedule bursts at the edge OBS nodes and three efficient resource allocation algorithms to schedule bursts at the core OBS nodes: 1) Bandwidth Allocation with Wavelength Preemption (BA-WP) scheme; 2) Bandwidth Allocation with Dynamic Wavelength Allocation (BA-DWA) scheme; and 3) Fiber Delay Line (FDL) allocation scheme. With the simulation results, we show that our approaches perform very well in terms of a controllable delay and burst dropping on both single-hopped and multi-hopped core networks. Moreover, our approaches provide a lower loss probability compared to previous works. To support QoS on OBS networks, the controllable burst loss probability for different service classes is achieved by our proposed algorithms.

Additionally, we analyze the Burst Blocking Probability (BBP) in case of the generalized probabilistic wavelength preemption algorithm for scheduling bursts at the core OBS node. The BBP of a new arrival burst of class n for a K -channel N -class system is presented. The analytical results on BA-WP closely follow the simulation results.

Furthermore, this thesis proposes Adaptive Wavelength Preemption (AWP) to provide end-to-end absolute QoS guarantees in OBS networks for real time applications. From the simulation, it is shown that AWP performs better than Early Drop (ED) scheme in terms of loss probability, while also guaranteeing the loss of high priority class. AWP is the effective solution to provide absolute QoS for WDM OBS networks.