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QOS PROVISIONING WITH SHARED WAVELENGTH ALLOCATION FOR LIMITED-RANGE WAVELENGTH CONVERSION

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Abstract. In this paper, we propose a wavelength classification to provide multiple QoS classes in terms of connection loss probability. With the classification, wavelengths are classified into two types of sets, dedicated wavelength sets and a shared wavelength set, and connections are established using idle wavelengths within either set at each node. To evaluate the performance of our proposed method for single link in the network, we model it as a two-stage queueing model and calculate the connection loss probability of each class with equivalent random method (EQRM). In addition, we evaluate the performance of the method for a uni-directional ring network by simulation. In numerical examples, we show that the proposed method is effective for QoS provisioning when the capability of wavelength conversion is large. Furthermore, it is shown that the proposed method is effective when low priority class requires small connection loss probability.

Keywords. WDM networks, QoS provisioning, limited-range wavelength conversion, two-stage queueing model, EQRM.

1 Introduction

Wavelength division multiplexing (WDM) technology can readily support high-speed data transmission with many hundreds of gigabits per second (Gbps) on a single optical fiber [7]. In all-optical wavelength routed network with the WDM technology, connection called lightpath is established using wavelengths between end nodes and data packets are transmitted with the established connection [5, 6, 8, 9, 11].

With the explosive growth of the Internet, a number of users utilize a variety of applications in all-optical wavelength routed network. Hence, QoS provisioning for connection loss probability that the connection establishment fails has been required [13] and QoS provisioning for the connection loss probability has been studied [2, 3, 4, 9, 10].

In [2], a wavelength allocation in which the pre-determined number of wavelengths are allocated to each QoS class has been considered. Throughout the paper, we call this allocation exclusive wavelength allocation. In the