Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **15 (2008)** 495-506
 http://www.watam.org

TOWARD OPTIMAL ROUTING OF LIGHTPATHS IN DYNAMIC WDM NETWORKS

Ning Fan[1] and Pin-Han Ho[2] and Zhao Pengfei[3]

[1]ningfan@bupt.edu.cn; Beijing University of Posts and Telecommunications
Beijing, China, 100088.

[2]pinhan@bbcr.uwaterloo.ca; Department of Electrical Computer and Engineering
University of Waterloo, Ontario, CA N2L 3G1.

[3]freshpenny@163.com; Institute of Mathematics
Jilin University, Changchun, Jilin Province,China, 130012.

Abstract. This paper provides an approximate optimal routing algorithm, called Relax-Converter-First (RCF), for dynamic WDM networks with heterogeneous and partial wavelength conversion capability in each node. The algorithm can derive an optimal solution if the cost of consuming a wave length converter is set much smaller than is the case for taking a wavelength channel. We propose a wavelength graph technique along with a modified Dijkstra's shortest path first algorithm. Simulation is conducted to verify the performance in terms of blocking probability focusing on the following two themes: first, a comparison in performance is conducted among the cases of using Fixed Alternate Routing, Shortest Path First Algorithm with Wavelength Graph (SPAWG), and RCF. Second, the performance of using the RCF scheme is examined with different cost of taking a wavelength converter in network nodes with different wavelength conversion capability. We also provide the simulation statistics about the optimality in using the RCF scheme under different network environments.

Keywords. Dynamic WDM network, optimal routing, algorithm.

1 Introduction

Optimal routing is defined as the task of selecting the best route (or the route with the least cost) from source to destination corresponding to a connection request based on the current link-state. In general, the optimal routing problem can be solved by Dijkstra's shortest path first algorithm, where the network topology is modeled as a graph with a cost on each directional links. Solving the optimal routing problem in multi-wavelength WDM networks needs extra care in modeling the networks since we can no longer treat the capacity along each link as a bulk of bandwidth. The wavelength continuity constraint and heterogeneous wavelength conversion capacity in each node should be considered in the modeling process.

For performing the optimal routing in networks with partial wavelength convertible nodes, I. Chlamtac proposed Shortest Path Algorithm with Wavelength Graph (SPAWG) [6]. The study in [3] provided a different wavelength graph technique than SPAWG with less computation complexity. Since both