LIGHTPATH ROUTE MANAGEMENT SYSTEM FOR IP-OVER-CWDM NETWORKS WITH ROADMS, BASED ON A ROADM GRAPH

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ABSTRACT. *Lightpath route management system has been designed and implemented for IP-over-CWDM networks with ROADMs. The system can search possible lightpath routes made by ROADMs with specified switch states. The function is based on a ROADM graph proposed for representing the ROADMs, and can output lightpath routes usable in the network together with the total optical loss values. The losses can be calculated by only 3 basic values for the ROADM and one value for the fiber link in the network. The experimental results clarified that the difference was within 1 dB between measured and calculated values. The system enables the network administrators to manage the lightpath reconfigurations effectively without errors by avoiding making unlinked lightpaths through routes with higher losses to connect nodes, before the reconfiguration.*
Keywords: ROADM, ROADM graph, Lightpath

1. **Introduction.** Optical networks are introduced widely to satisfy the increasing traffic demands for the Internet. Optical networks are also expected to provide effective broadband communications in optical LAN (Local Area Network) for business use, campus networks and factory networks to meet different application requirements. The CWDM (Coarse Wavelength-Division Multiplexing) technologies are effective for such applications, because no wavelength stability control is necessary, and therefore, the devices are low cost. The communication services are provided by connecting nodes with lightwaves and one optical connection with a wavelength is called a lightpath. Such networks have to be operated and maintained by the network administrators. The important tasks by the administrators are lightpath configuration in the initial network construction and reconfigurations [1, 2] in service of the network to avoid traffic congestions, depending on the demand changes. For the reconfiguration purpose, ROADMs [1] (Reconfigurable Optical Add/Drop Multiplexers) were proposed and investigated.

In the initial network design, a lightpath set is determined such that the estimated traffic in the area is groomed without congestions. In the reconfiguration processes while the network is in use, the new lightpath set is determined such that congestions in the present configuration are removed. Therefore, suitable algorithm and procedures are necessary to determine the lightpaths between nodes, depending on the appeared traffic. The issues to determine the lightpath set are often called the routing and wavelength assignment (RWA)