On Two-Link Network Survivability

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ABSTRACT

The rapid development of optical fiber transmission technologies has rendered the structure of present-day communication networks much simpler than it used to be. On the other hand, the performance standards imposed on the networks are getting stricter as the society itself becomes more dependent on the information provided via such networks. The simplicity in network structure undoubtedly lessens the cost burden associated with network construction and maintenance, but is in return more susceptible to severe network-service degradation under some component failures. In line with this changing network environment, an explosive growth in research activities has been made for the last several years on design of cost-effective networks which can provide a satisfactory level of network services at some component failures.

In this paper, we consider the issue of network survivability with focus placed on that against link failures. The link survivability is first defined as the relative portion of traffic amount still intact under a set of link failures. We then exploits its characteristics on the case of two-link failures to devise the so-called cycle factoring operation. We also develop a branch and bound procedure for two-link survivability of a general network, which successfully incorporates a sequence of cycle factoring operations. Computational experience with a wide range of test problems shows that the proposed procedure could be directly applied to obtain the two-link survivability of fairly large real-world networks.