Abstract

Telecommunication networks can be seen as the stacking of several layers like, for instance, IP-over-Optical networks. This infrastructure has to be sufficiently survivable to restore the traffic in the event of a failure. Moreover, it should have adequate capacities so that the demands can be routed between the origin-destination pairs. In this paper we consider the Multilayer Capacitated Survivable IP Network Design problem. We study two variants of this problem with simple and multiple capacities. We give two multicommodity flow formulations for each variant of this problem and describe some valid inequalities. In particular, we characterize valid inequalities obtained using Chvatal-Gomory procedure from the well known Cutset inequalities. We show that some of these inequalities are facet-defining. We discuss separation routines for all the valid inequalities. Using these results, we develop a Branch-and-Cut algorithm and a Branch-and-Cut-and-Price algorithm for each variant and present extensive computational results.

Keywords: IP-over-optical network, survivability, capacities, Branch-and-Cut-and-Price algorithms.