

Survivable Network Design I: Clustering Problem

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ABSTRACT

We propose a model and an algorithm for the clustering problem arising in the design of communication network. Given a set of nodes representing the set of central offices, a set of links, a traffic demand between central offices, and a set of candidate hub sites, the problem is to determine the locations of hubs and the partitioning of the set of nodes into local networks. The objective is to minimize total inter-cluster traffic.

We develop a clustering model for the problem. The model can reflect various constraints that should be satisfied by a feasible clustering. Specifically, we consider the topological constraints, logical constraints and survivability constraints.

An algorithm using a column generation approach is proposed. The problem is decomposed into a master problem and a column generation subproblem. We further decompose the column generation subproblem by using the hub locations. The column generation subproblem is solved by a branch-and-cut algorithm. Computational experiments using real problem data show that the proposed algorithm can solve practically-sized problems optimally within a reasonable time limit.