

# Design of Local Networks with Ring Structures

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## Abstract

We consider the problem of designing a local network with three types of ring structures. Local network design is made in a cluster where central offices in the telecommunication network are partitioned into several clusters. Each cluster is composed of one hub, central offices and conduits which connect them. We used only uni-directional self-healing rings and defined ring structures in consideration of the interconnection of two rings. The problem is to find optimal combination of ring structures which covers the offices while minimizing the total cost and satisfying the demands between all office pairs. We solved the problem by a decomposition and column generation. The master problem and subproblems are formulated as integer programming models. The master problem is to find an optimal combination of ring structures and subproblems are to get ring structures needed. Subproblems are solved by the branch-and-cut algorithm. As a result we obtained an optimal or near optimal solution for a real network within a reasonable time.