

Design of Communication Networks using Heuristics

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Determining a detailed planning of investments to build and upgrade a telecommunication network in order to maximize the expected net revenue amounts to notoriously difficult combinatorial problems. Solving these problems can not be done in a straightforward way within a reasonable calculation time, despite the ever-growing computational power of computers and the flexible off-line character of network planning.

To overcome these difficulties, basically two measures can be taken. First, some simplifying approximations are introduced, alleviating the considered problem to some extent. Secondly, by judiciously approaching the problem and by identifying the essential and less essential characteristics, one can devise a practical solution strategy, which leads within reasonable time to a solution without jeopardizing the solution quality.

After a general overview and discussion of these trade-offs, a practical heuristic approach will be presented, based on a philosophy of gradually increasing the level of detail. The strength of this approach will be shown on two realistic problems. One is the global design of a circuit-switched transport network (including topology design, routing and rerouting and capacity dimensioning). Second is a future optical packet switched network, where the influence of a particular node architecture (based on a recirculating buffer of fiber delay lines) on the end-to-end network performance is investigated.