Models for the Logical Topology Design Problem*

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Abstract. We address the logical topology design problem (LTD) in WDM transport networks under static traffic assumptions. We start with one of the standard MILP formulations of the LTD problem that aims at optimizing the network congestion. We propose an improvement to this model that additionally optimizes the average hop count. We then derive a new MILP model that compels the traffic to be atomically routed. This last model enables fair comparisons of solutions obtained with MILP formulations and with metaheuristic algorithms. The latter allow us to deal with large size networks whereas the former are limited by their computational complexity. In this paper Tabu Search is used to tackle the LTD problem. We compare and discuss the logical topologies computed by the various methods described in the paper.

1 Introduction

The *network design problem* consists of defining an optimal network configuration that fulfills specified traffic demands under technical and economical constraints [1]. Optimality is typically defined as the minimization of the network cost, maximization of specific network performance parameters (e.g. availability, call blocking, average packet delay, network congestion, etc.) or maximization of a function of the performance/cost ratio. In general, the minimum set of inputs for the design and dimensioning problem consists of a forecast of the traffic demands, topological data describing the physical links between nodes, and technical and cost information of the equipment and transmission infrastructure. The resulting optimal network configuration is typically described in terms of information on

* **N. Puech is also with I.U.T., University Paris 5, 143 Avenue de Versailles, 75016 Paris, France, e-mail : puech@iut.univ-paris5.fr**. This work has been funded by Alcatel R & I, Marcoussis, France under Grant No. CI 578. Nicolas Puech has been funded by the French National Educational System (Éducation Nationale) and the University Paris 5 in the form of a sabbatical. Nicolas Puech would like to express his thanks to Mrs. Dominique Gascon (Director) and Mr. Serge Blumenthal (Statistics Department), both from the I.U.T., University Paris 5, France, for having decided in favor of his sabbatical. Josué Kuri has been partially supported by CONACyT Grant No. 122688.

E. Gregori et al. (Eds.): NETWORKING 2002, LNCS 2345, pp. 301–313, 2002.