

## ABSTRACT

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An approach is presented to obtain solutions of the Routing and Spectrum Allocation (RSA) problems and the Routing, Modulation and Spectrum Allocation (RMSA) applied in an Elastic Optical Network (EON). The problem is decomposed and analyzed using two separate subproblems, which are employed to obtain solutions sequentially. The first is routing and the other is spectrum allocation (RSA) or modulation and spectrum allocation (RMSA) in an EON. For the first, we use the algorithms of Dijkstra and Yen; For the second, two approaches are investigated: one employing a greedy algorithm and the other using a genetic algorithm (GA). Scenarios are considered where Orthogonal Frequency Division Multiplexing (OFDM) is employed, which allows to perform spectral allocation. The maximum link length is determined by the modulation employed by the OFDM technique, that is, the more bits the symbol carries, the smaller the range of the link. Thus, there is an interdependence between routes, modulation and number of carriers that is solved in the RMSA problem. An essential aspect of this dissertation is the definition of a fitness function for the GA, which aims to evaluate the quality of the obtained solution. The simulations developed analyze the performance of RSA and RMSA problem solutions in EONs obtained with both approaches. The evaluated items are the behavior of the solutions obtained due to the increase in traffic demands, which is analyzed using the probability of blocking, as well as the capacity of demands met and, in addition, the execution times of the algorithms are evaluated.

Keywords: Dijkstra and Yen Algorithms; greedy algorithm; Genetic Algorithm; Fitness Function; Routing and Spectrum Assignments; Routing, Modulation and Spectrum Assignments; Elastic Optical Network.