

## Spectrum Assignment Algorithms in Optical Networks with Protection

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**Abstract :** In modern optical networks, the flex grid spectrum usage is most widespread, where higher bit rate streams get larger spectrum slices while lower bit rate traffic streams get smaller spectrum slices. To our practice, under the ITU-T recommendation, G.694.1, spectrum slices of 50, 75, and 100 GHz are being used with central frequency at 193.1 THz. However, when these spectrum slices are not sufficient, multiple spectrum slices can use either one next to another or anywhere in the optical wavelength. In this paper, we propose the analysis of the wavelength assignment problem. We compare different algorithms for this spectrum assignment with and without protection. As a reference for comparisons, we concluded that the Integer Linear Programming (ILP) provides the global optimum for all cases. The most scalable algorithm is the greedy one, which yields results in subsequent ranges even for more significant network instances. The algorithms' benchmark implemented using the LEMON C++ optimization library and simulation runs based on a minimum number of spectrum slices assigned to lightpaths and their execution time.

**Keywords :** spectrum assignment, integer linear programming, greedy algorithm, international telecommunication union, library for efficient modeling and optimization in networks

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