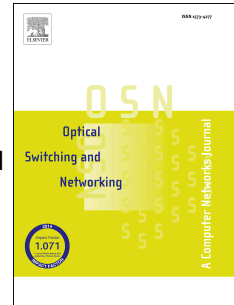


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Switching Adaptable Optimization of Resource Allocation for Space Division Multiplexed Elastic Optical Networks

Mohsen Yaghubi-Namaad^a, Akbar Ghaffarpour Rahbar^a, Behrooz Alizadeh^b, and Amin Ghadesi^a

^a Computer Networks Research Lab, Department of Electrical Engineering, Sahand University of Technology, Sahand New Town, Iran.

^b Department of Science, Sahand University of Technology, Sahand New Town, Iran

Abstract

Space division multiplexed-elastic optical networking (SDM-EON) is considered as the promising solution to overcome the capacity crunch of optical transport networks. The resource allocation problem of SDM-EON includes the route, modulation level, space, and spectrum assignment (RMLSSA). In this paper, we first investigate the effect of fiber types, switching solutions, and networking approaches on the resource allocation problem of SDM-EON, and try to consider comprehensive all-inclusive constraints. Then, a new generic formulation of switching adaptable (SA)-RMLSSA is proposed as an integer linear programming (ILP) for static traffic based on these comprehensive constraints. In addition, the heuristic switching adaptable resource allocation (SARA) algorithm is introduced. Finally, the paper evaluates the effectiveness of SARA, with two sorting policies of connection demands, to find the near-optimal solution of different networking approaches. This evaluation is performed for parallel spectral superchannel (PS-Ch), limited spatial-spectral superchannel (LS²-Ch), group limited spatial-spectral superchannel (GLS²-Ch), and free spatial-spectral superchannel (FS²-Ch) switchings (with both ribbon and ring configurations of multi-core fibers (MCF), and having or not having spatial guardband) with operational assumptions in regard to the quality of transmission (related to the used fiber type) and traffic profile. The effect of each networking approach, having modulation adaptivity tailored for each fiber type, enabling spatial guardbands for MCFs, and cores configurations are investigated by maximum utilized frequency slot index (MUFSI) and demand utilization ratio (DUR) as metrics of static traffic. Moreover, the use of SARA for dynamic traffic is investigated for real network experiment.

Index terms: Space Division Multiplexing, Elastic Optical Network, Network planning, Integer Linear Programming, Resource Allocation, RMLSSA, Multi-Core Fiber, Multi-Mode Fiber, Modulation Adaptivity, Static and Dynamic Traffic.

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