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IEEE North Jersey Communications Chapter

A Study of Waveband Routing and Wavelength Assignment in Multi-Granular Hybrid Optical Networks

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About the Speaker

Aleksandar Kolarov (S'89-M'93) received the B.Sc. and M.Sc. degrees, both in Electrical Engineering, from the University of Belgrade, Yugoslavia, in 1984 and 1987, respectively. He received the Ph.D. degree in electrical engineering from Rutgers University, New Jersey, in 1993, for his research in dynamic routing in multi-service communication networks. From 1984 to 1989, he was a Research Engineer at "Mihajlo Pupin" Institute in Belgrade, Yugoslavia. Since 1993, he has been with NEC Laboratories America in Princeton, NJ, where as a Senior Research Staff Member, is responsible for design and implementation of IP-based network architectures and protocols including quality-of-service, control and management.

About the Talk

Waveband routing and wavelength assignment (WRWA) has only recently attracted attention from the optical networking industry for its practical importance in reducing the control complexity and cost of optical cross-connects (OXCs). In this paper, we study WRWA tasks in hybrid hierarchical wavelength division multiplexing (WDM) networks with OXCs that can route multiple granularity (wavelengths and wavebands) at the same time. We first develop an integer linear programming (ILP) model with the objective to minimize the cost of optical-electronic-optical (OEO) and all optical (OOO) ports used. This is the first waveband switching ILP model developed for hybrid OXCs. Since the optimal ILP solution can only be obtained for networks of smaller size, we also develop a heuristic waveband routing and wavelength assignment algorithm. The proposed algorithm shows near optimal performance for networks of smaller size. In our heuristic approach, we solve the waveband routing and wavelength assignment sub-problems as a single problem, rather than separating them into two separate problems. The algorithm is solved by using Dynamic Programming, sequentially on one lightpath request at a time. We comment on the WRWA performance under various traffic scenarios. Our results demonstrate a significant cost reduction that could be achieved by employing hybrid hierarchical OXCs instead OXCs with opto-electronic fabric that can process a single granularity only.

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