

## Experimental Demonstration of Multidimensional Switching Nodes for All-Optical Data Center Networks - DTU Orbit (08/11/2017)

### Experimental Demonstration of Multidimensional Switching Nodes for All-Optical Data Center Networks

This paper reports on a novel ring-based data center architecture composed of multidimensional switching nodes. The nodes are interconnected with multicore fibers and can provide switching in three different physical, hierarchically overlaid dimensions (space, wavelength, and time). The proposed architecture allows for scaling in different dimensions while at the same time providing support for connections with different granularity. The ring topology reduces the number of different physical links required, leading to simplified cabling and easier link management, while optical bypass holds the prospect of low latency and low-power consumption. The performance of the multidimensional switching nodes has been investigated in an experimental demonstration comprising three network nodes connected with multicore fibers. Both high capacity wavelength connections and time-shared subwavelength connections have been established for connecting different nodes by switching in different physical dimensions. Error-free performance ( $BER < 10^{-9}$ ) has been achieved for all the connections with various granularity in all the investigated switching scenarios. The scalability of the system has been studied by increasing the transmission capacity to 1 Tbit/s/core equivalent to 7 Tbit/s total throughput in a single seven-core multicore fiber. The error-free performance ( $BER < 10^{-9}$ ) for all the connections confirms that the proposed architecture can meet the existing demands in data centers and accommodate the future traffic growth.

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Authors: Kamchevska, V. (Intern), Medhin, A. K. (Intern), Da Ros, F. (Intern), Ye, F. (Intern), Asif, R. (Intern), Fagertun, A. M. (Intern), Ruepp, S. R. (Intern), Berger, M. S. (Intern), Dittmann, L. (Intern), Morioka, T. (Intern), Oxenløwe, L. K. (Intern), Galili, M. (Intern)

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