A NEW AUGMENTED DATA VORTEX ALL OPTICAL INTERCONNECTION NETWORK WITH PERFORMANCE EVALUATION AND FAULT TOLERANCE STUDIES

BY

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CERTIFICATE

This is to certify that the thesis entitled "**A New Augmented Data Vortex All Optical Interconnection Network with Performance Evaluation and Fault Tolerance Studies**" being submitted by Neha Sharma to the Department of Electrical Engineering, Indian Institute of Technology, Delhi, for the award of degree of Doctor of Philosophy is the record of the bona-fide research work carried out by her. She has worked under our supervision and guidance. The thesis, in our opinion has reached the standards fulfilling the requirements of the regulations relating to the degree. The results contained in this thesis have not been submitted either in part or in full to any other university or institute for the award of any degree or diploma.

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ABSTRACT

In this thesis we have proposed a new *Augmented Data Vortex (ADV) switch,* an all optical packet switched interconnection network. The ADV proposes to (i) improve the fault tolerance of the all optical Data Vortex (DV) packet switch, which is reported as the more recent all optical packet switch that overcomes the limitations of optical buffering using fiber delay lines, optical bit level processing, TDM header and payload synchronization in optical domain, and also enjoys the features of high capacity, low latency, high scalability, low cross talk; and (ii) reduce the overall latency within the network, without degrading the performance regarding throughput and scalability.

The thesis is concerned with the topological, fault tolerance and performance related issues of the ADV network. The new interconnections, self routing, distributed control signaling, and optical domain implementation of the switch have been suggested. Results of fault tolerance and reliability in ADV have been evaluated through analytical study. Closed form expressions for fault tolerance, reliability, and all possible paths in ADV have been obtained. Performance regarding latency, latency distribution, and throughput, has been evaluated through numerical simulations. To assure performance and reliability in ADV, and to know the degradation in latency due to occurrence of faults, we have also evaluated the latency performance of the ADV under worst faulty condition. Also, the equivalent planar model for the 3 dimensional ADV and DV switches have been found which are more suited for topological comparisons with other multi stage interconnection networks.

The results obtained for ADV network have been compared with the DV switch.

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