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ENHANCED ANTNET-BASED SCHEME FOR ROUTE, WAVELENGTH AND TIME-SLOT ASSIGNMENT IN OPTICAL BURST SWITCHED NETWORK

ABSTRACT

All-optical networks are the aspiration of bandwidth greedy applications providers and users such as Telecom operators and scientific research centers. Therefore, some optical switching paradigms have been proposed to achieve this target. Among these paradigms, Optical Burst Switching (OBS) is seen as a viable solution. However, OBS is yet to be feasible due to high burst loss as a result of contention at the core node. Burst loss remains the major issue in this technology and it is caused by the lack of memory in the core routers. According to current optical technology reviews, cost effective optical memories are yet to be available. In this research, a route and wavelength algorithm as well as time-slot allocation algorithm are developed for Hierarchical Time Sliced Optical Burst Switching (HiTSOBS) and implemented in mesh Wavelength Division Multiplexed (WDM) OBS networks. The aim of this research is to reduce burst loss rate, minimize transmission delay and increase network throughput while satisfying burst requirements such as minimum loss, delay and high throughput. In order to achieve these objectives, route and wavelength selection algorithm was designed based on AntNet which is a variant of Ant Colony Optimization (ACO) algorithm for communication networks while time-slot assignment algorithm was based on burst priority. The developed algorithms were integrated into one scheme called AntNet-based Route, Wavelength and Time-slot Assignment algorithm (ARWTA). An enhanced version of HiTSOBS event driven simulator was designed. This simulator was used to evaluate the proposed solution by comparing it with Open Shortest Path First (OSPF). Also, the performance of HiTSOBS and OBS architectures was assessed using the same simulator. Simulation results show that, the new scheme outperforms OSPF in terms of Burst Loss Ratio (BLR) (20%), delay (30%), and throughput (18%). The high performance of the solution is attributed to the resilience of the algorithm and its support of QoS through the hierarchy of HiTSOBS and the priority-based time slot assignment algorithm. The results also demonstrate that HiTSOBS architecture performs better than conventional OBS due to the efficient use of network resources in HiTSOBS.