SINGLE AND MIXED LINE RATE VARIATION FOR DEDICATED PROTECTION IN ELASTIC OPTICAL NETWORKS

Satkunarajah Suthaharan, Rukshani Puvanendran, and Vanuja Chandrakumar
Vavuniya Campus of the University of Jaffna

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INTRODUCTION AND OBJECTIVES

WDM is a multiplexing technique of data transmission in which it divides the huge transmission bandwidth available on a fiber into several non-overlapping wavelength channels and enables data transmission over these channels simultaneously [1, 2]. WDM systems enable to increase the capacity of the network without laying additional fiber. In our research study, we have focused on survivability approach, specifically, dedicated protection method in WDM optical networks that received much attention in the research community nowadays. Elastic optical (or flexgrid) networks (EONs) have recently been introduced to use the frequency spectrum more efficiently [3]. 12.5 GHz fine granular frequency slots or flexible grids are used for setting up lightpaths instead of using 50 GHz or 100 GHz fixed grid spacing in EON [4]. Our objective in this paper is to investigate variation of the spectrum efficiency of traditional shared protection and elastic optical networks using MLR in various scenarios.

RESEARCH METHODS

The configuration for both WDM and elastic optical networks scenario, a recently proposed switch architecture [5] which achieve faster performance has been used in our investigation. The switch uses components such as variable optical splitters (VOSs) and combiners, bandwidth variable transponders (BVTs), flexible wavelength selective switches (Flex WSS). Further, less power consumption caused by the components can be achieved in the switch architecture. Therefore, to illustrate shared protection in elastic optical networks for MLR, we use switch architecture in the NSF network topology. A single wavelength carries a higher data rate than a single frequency slot carries. Therefore, when considering MLR in both wavelengths and frequency slots vary from SLR which has the unique data rate throughout the entire connections establishment. Further, to implement limiting the number of working links, we propose an algorithm. This algorithm consists of setting up primary and backup paths and their wavelengths or frequency slots. Source, destination, and the data rate are the inputs. This is used to accommodate lightpaths and to calculate the spectrum efficiency for MLR.

RESULTS AND DISCUSSION

We simulate the traditional dedicated protection approach in elastic optical networks. To perform the experiment we use NSFNET (14 nodes and 21 bidirectional links) topology for our study. We consider 352 frequency slots each of which consists of 12.5 GHz spacing. Various data rates such as 100 Gbps, 400 Gbps, 1 Tbps are considered in both mixed-line rate and single-line rate with their appropriate bandwidths and are followed the uniform distribution. Request arrival process follows Poisson distribution and holding time of requests follow exponential distribution with unit mean. Traffic requests arrive in dynamic network environment. Source node and destination node of each request follow uniform distribution. We assume the guard band in between two frequency slots is 12.5 GHz. Each experiment is simulated with various request arrivals in order to compute the total amount of bit rate and bandwidth used. In this study, we consider dedicated protection in EON particularly, for MLR. This is because to measure the spectrum efficiency caused by both MLR and SLR in various scenarios. We select the traffic bit rate ranges from 20 Tbps to 100Tbps for all comparisons that are used to calculate spectrum efficiency. Such that they provide approximately the same spectrum efficiency. This helps us to find and compare the relative impact of the performance on different scenarios. Our performance study is