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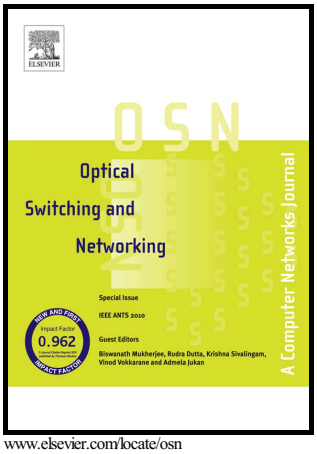

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Wojciech Kabaciński*, Marek Michalski, Mustafa Abdulsahib

Poznan University of Technology, Faculty of Electronics and Telecommunications, ul. Polanka 3, 60-965 Poznań, Poland

Abstract

In this paper, we address the problem of wide-sense nonblocking operation of the elastic optical switch. The switch consists of waveband-converting switches in input and output stages, while in the center stage there is only one wavelength-selective space switch without wavelength-conversion capabilities. Two control algorithms are proposed, namely, 2-split and 3-split. For these algorithms we derived wide-sense nonblocking conditions and compared them with strict-sense nonblocking ones. The results show that the 3-split algorithm reduces the required number of FSUs to up to almost 70% of the FSUs required in the strict-sense nonblocking switching fabrics. Application of the proposed elastic optical switch in optical datacenter networks is also proposed.

Keywords: Elastic optical switch, wide-sense nonblocking, switching networks, optical switching.

1. Introduction

Optical networks can provide connections of high bit rates, but advances in modulation techniques and signal processing allow us to send signals with the same bit rate using a lower bandwidth than the one available in optical channels defined by ITU-T in the DWDM standard. Therefore, ITU-T upgraded this standard by adding flexibility to an earlier defined DWDM grid [1]. In this new standard, the minimum portion of spectrum, which can be used by a connection, is called the slot width granularity, and is equal to 12.5 GHz. This slot width granularity is also called a "frequency slot unit" (FSU) [2]. A connection may occupy a spectrum of width $m \times 12.5$ GHz, which is called a frequency slot~~, and the connection is called an m-slot connection~~. **A connection which occupies m FSUs is called an m-slot connection.** The nominal central frequency of a connection is ~~$f = 193.1 + n \times 0.00625$~~ $f = 193.1 + x \times 0.00625$ THz,

*Corresponding author

Email addresses: wojciech.kabacinski@put.poznan.pl (Wojciech Kabaciński), marek.michalski@put.poznan.pl (Marek Michalski), mustafa.abdulsahib@doctorate.put.poznan.pl (Mustafa Abdulsahib)