Service level Control of Traffic Requests in Orthogonal Frequency Division Multiplexing Based Elastic Optical Networks

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Abstract— OFDM based EONs improves the transmission capacity and flexibility and ensure the service level control of traffic request. Routing and spectrum assignment method can be implemented in OFDM based EONs. This proposed method takes the advantage of both elastic optical networks and OFDM and it can solve the service degradation of immediate reservation due to the preservation characteristics of advanced reservation request.

Key words: Elastic Optical Networks, OFDM, IR, AR, RSA

I. INTRODUCTION

Elastic optical networks is a promising technology that improves the transmission capacity because it has flexibility to handle the spectrum resources based on the modulation format and optical reach. Routing and spectrum assignment is the first and most important issue that affects the elastic optical networks which is based on space division multiplexing. Repeatedly setting up and taking down the connections leads to many fragmentations. These fragmentation results spectrum resource wastage. Immediate reservation request and Advance reservation request are the two traffic requests which provides access to spectrum resources but the current resources available for immediate reservation request are wasted due to the advance reservation characteristics of the Advance reservation request. These problems can be solved by the implementation of space division multiplexing based Elastic optical network. Space division multiplexing technologies include multifibers, cores and modes but it requires sophisticated resource-management procedure to avoid the crosstalk between the channels.

This paper describes the method of Orthogonal frequency division multiplexing (OFDM) based Elastic optical networks which improves transmission capacity and solve the interference problem which results very efficient spectrum resource usage and service level control of traffic requests. Therefore, OFDM based EONs much improves transmission capacity and flexibility and extends the transmission capability for optical communication.

The remaining of the paper is organized as follows: Section 2 describes the proposed system .Section 3 describes the scheme of HSVS and steps used for HSV presented in section 2.Then, section 4 concludes the paper.

II. PROPOSED SERVICE LEVEL CONTROL OF TRAFFIC REQUEST IN OFDM BASED ELASTIC OPTICAL NETWORKS

A. OFDM based EONs

The advantage of this network architecture is efficient spectrum resource usage, where it only assigns resources with sufficient bandwidth according to the requirements of the connections. This is possible because EONs can assign spectrum resources to each connection using a flexible grid by selecting modulation formats based on both the requested bit rates and the optical reach, but, it is essential to provide further transmission capacity in order to cope with exponential increases in network traffic [1].

The demand for flexible high data rates has increased due to the rapid growth in technology. The performance of high data rates communication system is limited by interference. Orthogonal frequency division multiplexing is a multicarrier modulation technique which divides the available spectrum into a number of parallel subcarriers and each subcarrier is modulated by a low rate data stream at different carrier frequency.

B. Advantages of OFDM Based Elastic Optical Networks

1) OFDM allows simultaneous transmission thus making the efficient use of the available spectrum
2) More resistant to frequency selective fading.
3) OFDM makes the use of cyclic prefix which helps in eliminating ISI and ICI.
4) Less sensitive to the timing offsets than single carrier system.
5) Efficient and d cost effective.

C. Traffic Request Control in OFDM based EONs

Traffic requests can be classified into two types: IR and AR requests. IR requests allocate bandwidth and start data transmission immediately after the request arrival time. By contrast, AR requests can reserve future resources in advance and actually allocate the bandwidth at the service start time. AR requests are expected to provide better QoS for applications that require large amounts of bandwidth. Furthermore, AR requests can be beneficial for efficient network resource usage compared with IR requests because of the flexibility in the time domain.

D. Routing and Spectrum Assignment Methods for OFDM based EONs

This method configures prioritized areas based on the required frequency slots; each prioritized area is divided into two sub-areas: one dedicated to IR requests (IR-dedicated sub-area) and another that is shareable for both IR and AR requests (shareable sub-area of the IR dedicated and shareable sub-areas is moved dynamically to obtain the desired ratio for the BBPs [1] of IR and AR requests. Each prioritized area and sub-area follows the same spectrum division in all the cores of the network at all times because this helps to satisfy the continuity Constraints on a transmission route in RSA. This method is called AR-limited (AR-L) [1].

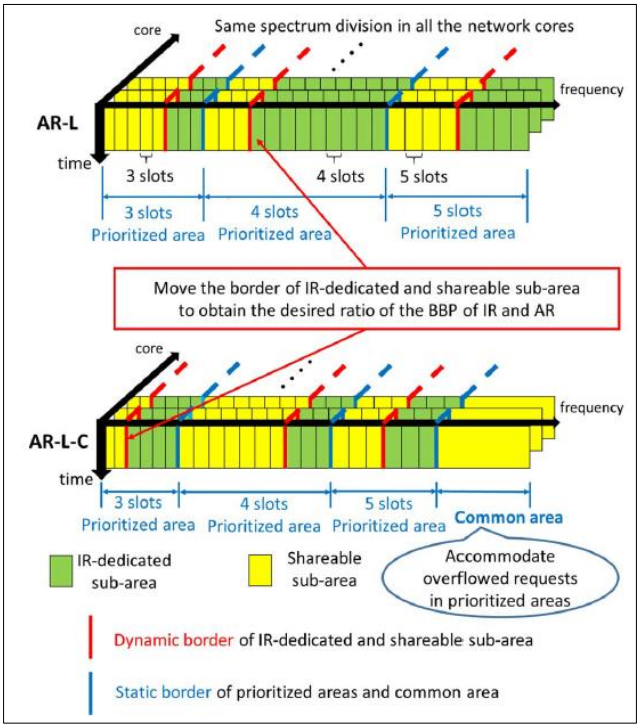

Fig. 1: Virtual resource design of the Routing and Spectrum Assignment (RSA)

There is e another RSA method that configures common areas in addition to prioritized areas to reduce spectrum fragmentation. This method is called AR-Common (AR-L-C). In AR-L, if a prioritized area is fully occupied, overflowed requests are allocated in other prioritized areas. This generates spectrum fragmentation in other prioritized areas, and, subsequently, fragmentation occurs in the area. To cope with this situation, AR-L-C configures a common area in addition to prioritized areas in order to accommodate overflowed requests in prioritized areas. If there is a common area, spectrum fragmentation likely occurs not in prioritized areas but in the common area, which ensures resource alignment in prioritized areas and also reduce the effects of difference in total bandwidth[1].

III. Conclusion

Orthogonal frequency division multiplexing based elastic optical network improves the transmission capacity and the implementation of RSA method in OFDM based EONs leads to suitable spectrum resources alignment. Spectrum fragmentation and wastage of spectrum resources can be solved as well as the service level control of IR request and AR request. Therefore, RSA method can be implemented in OFDM based EONs which doubles the transmission capacity and flexibility and combines the advantage of both RSA and OFDM scheme

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