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A Survey on Achieving Hitless Defragmentation with Dynamic Fragmentation Using Mixed Path Algorithm

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ABSTRACT:

Motivation

Increasing traffic on a node a fragmentation becomes main issue for such dynamic traffic. Other subtopic on handling dynamic traffic will not clearly mention the technical things. This paper gives detail explanation about such things.

Objective and Scope:

The lightpaths coming on source is day by day increasing. Fragmentation of lightpath is main solution for avoiding the blocking probability. The RSA algorithm is performed for the lightpath routing and the allocation of spectrum .The main target behind this to achieve a hitless defragmentation by exchanging of paths. The application where used there is streaming of large video or broadcasting of video where there will be large transmission of data through one path.

Goals:

1) Toggling primary to backup path and vice versa using path exchanging scheme to achieve hitless defragmentation rather than spectrum retuning.

2) Performing spectrum defragmentation process for dynamic process where ILP problem is not traceable.

Problem Statement

Elastic optical network (EON) technology arises as a promising solution for future high-speed optical transport, since it can provide superior flexibility and scalability in the spectrum allocation for seamlessly supporting diverse services, while following the rapid growth of Internet traffic. With connections being added and terminated at any moment in dynamic EONs, the spectrum resources previously utilized by terminated connections are to be reallocated to new requests. As the requests are of varied size, this leads to the appearance of small sized spectrum slot blocks and to dispersed slot blocks that are not available through contiguous links. Several methods have been proposed in order to combat this. Perhaps the simplest method of this Hitless Defragmentation with 1+1 path exchange functions. In these, the data is fragmented at the source and destination side. So we can minimize the problem of appearance of small sized spectrum slot blocks and we can achieve a hitless defragmentation too

I. INTRODUCTION

Spectrum fragmentation is one of primary concern. The connection is to be added or terminated, the spectrum resources utilized by terminated connection to be reallocated. Small blocks to be scattered these are not available in contiguous link. This is spectrum Fragmentation. To defeat the issue a few defragmentation approaches have been displayed. The creators demonstrate that keeping away from spectrum fragmentation is availability of large slot blocks and alignmentthrough consecutive link. To accomplish that, both preventive and receptive methodologies have been considered. A hitless defragmentation approach works ceaselessly in EONs without service disruption. Spectrum retuning is being used to achieve hitless defragmentation. With spectrum retuning, lightpaths are retuned and moved to fill holes left, either by push-pull retuning [4] or bounce retuning. Link failures are another challenge for EON. Optical systems carry huge data which leads to data loss. The author introduced a 1+1path protection defragmentation approach in EONs. Their focus is set on the defragmentation advantage offered by the backup paths.. They consider that, corresponding primary path; they can be reallocated and/or rerouted for defragmentation purposes without causing any traffic disruption. In this way, the authors accomplish hitless defragmentation by performing spectrum retuning.

II. LITERATURE SURVEY

1. **Weiran Shi, Zuqing Zhu, *Senior Member, IEEE*, Mingyang Zhang, and Nirwan Ansari, *Fellow, IEEE*"On the Effect of Bandwidth Fragmentation on Blocking Probability in Elastic Optical Networks".**
   Analysing the effect of bandwidth fragmentation on the blocking probability in EONs. Analysis shows that two factors related to bandwidth fragmentation have effects on blocking probability. The extent that the available slot blocks (i.e. blocks of contiguous slots) on different links are aligned on spectrum locations and the sizes of the available slot-blocks in links' spectra for future requests.

2. **K.Christodoulpouls, I. Tomkos, E. A. Varvarigos "Routing and Spectrum Allocation in OFDM-based Optical Networks with Elastic Bandwidth Allocation".**
   This paper considers the planning problem of an OFDM based optical network where we are given a traffic matrix that includes the requested transmission rates of the connections to be served. They introduced the Routing and Spectrum Allocation (RSA) problem and presented various algorithms to solve it. They also used one by one connection that used to solve planning problem sequentially drawing a strategy for all traffic matrix.

3. **Mingyang Zhang, Weiran Shi, Long Gong, Wei Lu, Zuqing Zhu "Bandwidth Defragmentation in Dynamic Elastic Optical Networks with Minimum Traffic Disruptions".**
   The proposed algorithm accomplishes defragmentation through proactive network reconfiguration that only reroutes a portion of existing connections. The proposed algorithm only needs to reroute ~30% existing connections. The simulations also demonstrate that the traffic disruption percentages are less than 1% for defragmentation with 30% rerouting and can be further reduced to within 0.25% by adding a move-to-vacancy (MTV) approach in the traffic migration.

4. **Roberto Proietti, Chuan Qin, Binbin Guan, Yawei Yin, Ryan P. Scott, Runxiang Yu, S. J. B. Yoo "Rapid and complete hitless defragmentation method using a coherent RX LO with fast wavelength tracking in elastic optical networks".**
   The proposed defragmentation technique is capable of hopping over an existing connection. This paper demonstrates a rapid and full hitless defragmentation method in elastic optical networks exploiting a new technique for fast wavelength tracking in coherent receivers. This technique can be applied to a single-carrier connection or each of the subcarriers forming a super channel. The wavelength spectrums are divided into smaller units. There is arising of new problem with added flexibility. As a fragments are non-contiguous nor aligned with path they become stranded bandwidth that can be utilized by new incoming request.

5. **F. Cugini, F. Paolucci, G. Meloni, G. Berrettini, M. Secondini, F. Fresi, N. Sambo,L. Potì, and P. Castoldi, "Push-Pull Defragmentation Without Traffic Disruption in Flexible Grid Optical Networks".**
   The technique is based on dynamic lightpaths frequency retuning upon proper reconfiguration of allocated spectrum resources. It does not require additional transponders and does not determine traffic disruption. All the relevant technological limitations that may affect the push-pull applicability are discussed in the context of both optically-amplified direct and coherent detection systems. Proposing, and evaluating a novel defragmentation technique called Push-pull. The main limitation of this push pull defragmentation is due to laser applicability. Push-pull technique is directly observed for coherent decision.

6. **S. Kosaka, H. Hasegawa, K. Sato, T. Tanaka, A. Hirano, M.Jinno "Shared Protected Elastic Optical Path Network Design that Applies Iterative Re-optimization based on Resource Utilization Efficiency Measures".**

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An advanced RSA algorithm that employs iterative path relocation for shared protected elastic optical path networks. It enhances backup path sharing and reduces spectrum fragmentation. Numerical experiments verify that the proposed method can substantially reduce the total number of fibres and frequency slots needed.

7. **Aras Tarhan, CicekCavdar "Shared Path Protection for Distance Adaptive Elastic Optical Networks under Dynamic Traffic".**
   Developing a novel RSA (Routing and Spectrum Allocation) algorithm applying different strategies for primary and backup resources called Primary First-Fit Modified Backup Last-Fit (PF-MBL) aiming to reduce the fragmentation and to increase the shareability. As a result overall bandwidth blocking probability is significantly reduced in the network. Results show that PF-MBL can improve the performance in terms of bandwidth blocking probability by 24% up to 59%.Wavelength division multiplexing (WDM) technique has been used in optical network. In conventional WDM networks, shareability used to be one of the main objectives to maximize the backup resource efficiency.

8. **Y. Sone, A. Watanabe, W. Imajuku, Y. Tsukishima, B. Kozicki, H. Takara, M. Jinno"Bandwidth Squeezed Restoration in Spectrum-Sliced Elastic Optical Path Networks (SLICE)".**
   The paper shows that a bandwidth squeezed restoration (BSR) scheme in our recently proposed spectrum-sliced elastic optical path network (SLICE). The proposed BSR takes advantage of elastic bandwidth variation in the optical paths of SLICE. It enables spectrally efficient and highly survivable network recovery for best-effort traffic as well as bandwidth guaranteed traffic, while satisfying the service level specifications required from the client layer networks. It enables recovery of highly survivable network for best traffic as well as guaranteed traffic.

9. **Mirosław, Klinkowski "An Evolutionary Algorithm Approach for Dedicated Path Protection Problem in Elastic Optical Networks".**
   We focus on RSA in a survivable EON with dedicated path protection (DPP) consideration. Because RSA is a difficult problem itself, we develop an evolutionary algorithm (EA) with the aim to support the search for optimal solutions. We investigate the effectiveness of the algorithm for a set of survivable network scenarios. We have proposed a novel EA-MSF algorithm that is based on the evolutionary algorithm meta heuristic combined with a greedy RSA algorithm—as the RSA algorithm we use the MSF algorithm.

10. **Hiromi UEDA, Toshinori TSUBOI, Hiroyuki KASAI "Hitless switching scheme for protected PON system".**
    The system proposes hitless switching schemes for protected PON systems based on the PON's ranging functionalities. ITU-T Rec. G.983.5 methods, however, always bring about signal loss when switching is performed. If hitless switching is available, the operator can carry out that activity anytime without impacting users, and can also offer higher-grade broadband services.

11. **MichałAibin, Krzysztof Walkowiak, "Defragmentation Algorithm for Joint Dynamic and Static Routing Problems in Elastic Optical Networks with Unicast and Any cast Traffic".**
    One to one of much transmission is attracting a lot of interest. Since network requires data delivery technique in inter centre networks. The main target of this algorithm is to improve the network performance under dynamic traffic condition in terms of blocking probability. Condition for traffic pattern of CISCO shows that our algorithm can be significantly improves the performance under the network blocking probability.

12. **Yawei Yin, Huan Zhang, Mingyang Zhang, Ming Xia, Zuqing Zhu, Stefan Dahlfort, "Spectral and Spatial 2D Fragmentation Aware Routing and Spectrum Assignment Algorithms in Elastic Optical Networks".**
    The observation considers the spectrum fragmentation problem. This paper also introduces RSA algorithm. The whole scenario shows that the RSA algorithm and FA algorithm with congestions avoidance will decrease the performance in existing scheme in terms of blocking probability (BP).Fragmentation in computer memory is one of the major problem. The problem of fragmentation in EON is more problem. Since, it is included into two dimensional problems. I.e. Spectral and Spatial domains. There are many observation are considered but none of

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them achieved the two dimensional problem. Defragmentation scheme which reactively reconfigure the spectrum after it is fragmented.

III. PROPOSED SYSTEM APPROACH

A Path Exchanging With 1+ 1 Path Protection

By considering path protection to give protection against connection breaking. With 1+1 way protected network, each lightpath is copied and sent through various ways. This process will give chance to choose the incoming information from any of the two signal. By considering above statement, if one connection broken down, data communication through other ways continuously going without any interrupt.

B. Hitless Defragmentation with Exchanging Paths

The idea is able to achieve hitless defragmentation path protected networks without any external devices. Taking an advantage of the availability default alternate signal to reallocate lightpaths considering spectrum fragmentation. Since the lightpath is being received through the primary paths, we can afford to reallocate the lightpaths on backup paths during the defragmentation process without disrupting the data communication. The process is on operation without any failure that is arising on primary path while the backup path has been reallocated. For eliminating spectrum fragmentation, the profit is able to reallocate both paths of the 1+1 protection for hitless defragmentation without restriction. With the assigned and dedicated backup and primary paths where data from backup paths are used only if there is some impediment on the corresponding primary paths, only backup paths can be reallocated in a hitless defragmentation.

C. Defragmentation Approach With Path Exchanging Scheme

By setting the target of taking maximum traffic load in 1+ 1 path protected EON, the proposed paths exchanging scheme is applied. It decreases the spectrum fragmentation by minimizing blocking probability. Scheme is applied depends upon the dedicated traffic pattern. With static traffic loads, the spectrum state does not change often overtime, but with dynamic traffic loads, the spectrum is in change. In static traffic load, spectrum fragmentation issue can be neglected by network planning, and the optimization problem is used in the rare occasions. For dynamic traffic loads where lightpaths can be added or removed at any time, the spectrum defragmented quickly in order to avoid requests being blocked due to fragmentation. In the following, we concentrate on dynamic traffic loads.

Advantages Of Proposed System

I. A hitless defragmentation can be achieved.
II. Spectrum fragmentation which is main issue can be overcome using path exchanging scheme
III. Because of toggling backup to primary and vice versa the data in EON can be protected using mixed backup and primary path algorithm.

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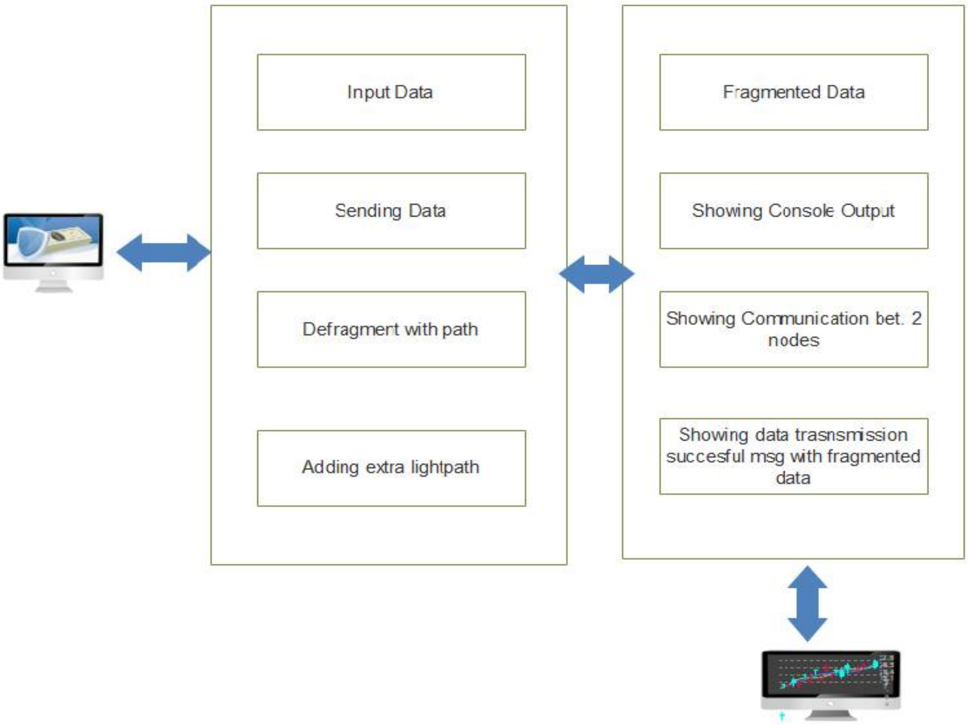
System Architecture / Methodology



IV. EXPLANATION

The overall architecture deals with the function defragmentation, path exchanging, communication between two nodes and message transmission. Inputting the lightpath is to fulfill the requirement of fragmentation which is main issue in the architecture. The desired output ready to display on the console which is already fragmented. The NARR protocol used for transmission of data between two nodes and output is displayed on the console. The extra lightpaths are added where there is requirement of real time problem such as Dynamic fragmentation where we add the lightpath along with fragmentation and at last all the is fragmented.

V. CONCLUSION AND FUTURE SCOPE

This paper has proposed a defragmentation scheme utilizing essential and reinforcement ways trading in 1+1 way ensured EONs to enhance activity acceptability. The proposed scheme change the function of lightpaths in a 1+1 path protection from primary to backup path on the other hand to allow initially primary lightpaths to be reallocated for defragmentation.The proposed scheme also offers a hitless defragmentation by path exchanging. We have defined an optimization problem of the static spectrum reallocation with limited network operations (SSR-LNO), which minimizes the spectrum fragmentation, and formulated it as an ILP problem. We have demonstrated that the SSR-LNO is NP-complete. We have displayed a range defragmentation approach for dynamic EONs, and presented a heuristic calculation tractable for vast systems. The reproduction comes about propose that the presented heuristic calculation offers blocking exhibitions tantamount to the ones acquired utilizing the ILP approach. The proposed path exchanging scheme outperforms the conventional scheme with designated primary and backup paths, with up to 10% additional admissible traffic when the processing speed is considered.

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