광네트워크에서 다양한 1:1 보호 방법을 이용한 자원 효율성에 관한 연구

A Study on the Resource Utilization with various 1:1 protection policies on the Optical Networks

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Abstract

This paper considers to applying the concept of load-balancing into protection mechanism. We compare a common 1:1 Model (MODEL1) with Models doing load-balancing by simulating in Torus topology. Through the simulation results, we show Models using load-balancing concept have higher sharing rate and lower call request blocking rate. Especially, Model4 has average 30% higher sharing rate and 20% lower blocking rate than Model1.

I. Introduction

Recently, as the traffic of multimedia data is increasing, optical network has drawn much attention, and the problem of survivability of network became one of the pivotal issues because of transferring much traffic and supporting Quality of Service (QoS).

So far, in the real field, 1+1 and 1:1 protection mechanism commonly has been used, but the efficiency of those protection schemes is very low when it is applied to optical mesh network. In addition, up to date, the concept of GMPLS is well known, especially the term of Traffic Engineering (TE) is commonly used, so using the capacity of entire network efficiently through load-balancing became the important issue.

In this paper, we analyze four kinds of models, which use preconfigured protection [1] scheme. When we assume the load is the call requests to reserve wavelengths for WP and BP, we use the concept of load-balancing for reserving wavelength for WP and BP. When we receive call requests for WP and BP, we can achieve higher sharing rate of BP by using the concept of load-balancing which can be various and selected by the policy of each model. Moreover, we are able to achieve 100% restoration by not using the wavelength which is shared by BPs that have each WP in the same SRLG [2]. We will compare the simulation results of four different models and show how many wavelength sharing rate we can achieve.

In the following section, we show simplified flow of proposed mechanism which is common part of the models. Simulation assumption is given. We also give the analysis about simulation results. We make a conclusion with future research direction.

II. Proposed mechanism

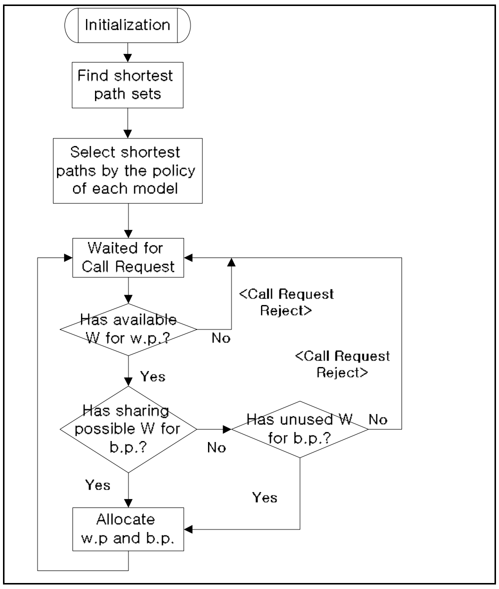

Fig.1 Simplified flow of proposed mechanism

III. Simulation assumptions

In the experiment, following assumptions are made:

- Find the shortest path set from a node to other node
- Select shortest path for WP and BP by the policy of each model. Case1 and Case2 are selected alternately

	Case1	Case2
Model 1	WP : path1	No use
	BP : path 2	
Model 2	WP : path 1	WP : path2
	BP : path 2	WP : path1
Model 3	WP : path1	WP : path1
	BP : path2	BP : path3
Model 4	WP : path1	WP : path3
	BP : path2	BP : path2

- Each link capacity (W) is unlimited for evaluating sharing rate or 32 wavelengths for evaluating call request blocking rate
- The number of node N is 16
- Call request is 8*Load (Load is positive integer)
- Each node has no wavelength converter
- WP and BP are disjointed paths. When we look for a sharable wavelength for BP, the wavelength should not be shared by BPs that have the WP which belongs to same SRLG.
- We choose Torus topology because it has many paths from a source to a destination and the lengths (number of nodes to be passed) of them are similar each other.

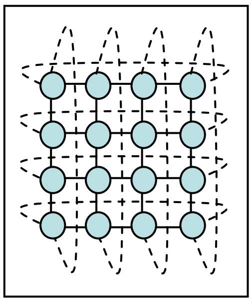

Fig.2 A 2-dimensional 4X4 Torus Topology

IV. Simulation Results and Analysis

MODEL 2, 3 and 4 using load-balancing scheme have higher sharing rate than MODEL1 (Fig.3). Especially, The gap of sharing rate between MODEL1 and MODEL4 is average 30%, so we can confirm the MODEL4 is extremely efficient than MODEL1.

In the Fig.4 MODEL2, 3 and 4 have lower blocking rate than MODEL1. Most of all, MODEL 4 has 20% lower blocking rate at load 18 than MODEL1. It means that if we use MODEL4, we can achieve higher network throughput through making more call requests acceptable in the network.

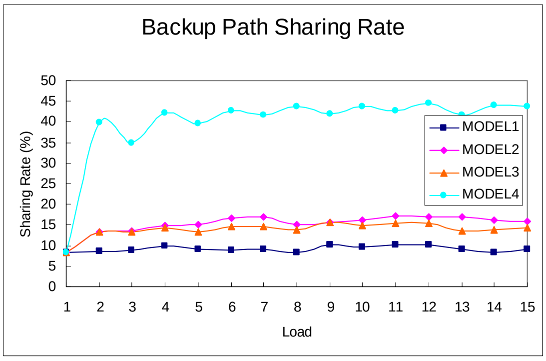

Fig 3. Backup Path Sharing Rate of MODEL 1-4

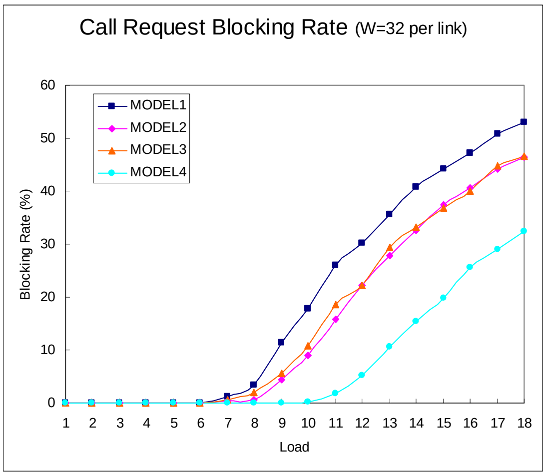

Fig 4. Call Request Blocking Rate of MODEL 1-4

V. Conclusion

Through applying the concept of load-balancing into protection mechanism, we can achieve much higher wavelength sharing rate with 100% restoration.

ACKNOWLEDGEMENT

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