UNIVERSITI PUTRA MALAYSIA

GREEDYZERO-BASED SCHEDULING ALGORITHM TO ROUTE IN OPTICAL LOW STAGE INTERCONNECTION NETWORKS

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By

MEHRNAZ MOUDI

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the degree of Master of Science

GREEDYZERO-BASED SCHEDULING ALGORITHM TO ROUTE IN OPTICAL LOW STAGE INTERCONNECTION NETWORKS

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Chairman: Professor Mohamed Othman, PhD

Faculty: Computer Science and Information Technology

A class of dynamic interconnection networks is Multistage Interconnection Networks (MINs) that is popular in switching and communication applications. In recent years, MINs have assumed important because of their cost-effectiveness. The advances in electro-optic technologies have made significant improvement in the optical technology. The idea of optical implementation of MINs meet the ever increasing demands of high performance computing communication applications for high channel bandwidth, low communication latency and parallel processing. Optical Multistage Interconnection Network (OMIN) is very popular in switching, large transmission capacity, and communication among other types of interconnection networks. OMINs present crosstalk that related with optical switches, as a result of undesired coupling two signals within each switching element. Therefore, it is not possible to route more than one

message at the same time, without any crosstalk, over a switching element in an OMIN. This thesis is focused on an efficient solution to avoid crosstalk, which is routing traffic through an optical network to avoid coupling two signals within each switching element.

Under the constraint of avoiding crosstalk, what we have been interested is how to realize a permutation that will use the minimum number of passes, the minimum execution time and the maximum bandwidth to route the input request to output without crosstalk. Many algorithms have been designed to perform the routing better. This research contains two approaches to improve the performance of networks to solve the problem. First, the new architecture of Interconnection Network (Low Stage Interconnection Network) is proposed to reduce number of switches and decrease execution time considerably while modifying bandwidth and number of passes via the same low stage transformation is negligible. Then the GreedyZero algorithm is developed to minimize the number of passes approximately 30% in compare with Zero algorithm to route all the inputs to outputs without any crosstalk. The GreedyZero algorithm has been presented in the Low Stage Interconnection Network. This algorithm has been developed to achieve performance goals in terms of 50% reduction in the number of passes.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan Ijazah Master Sains

BERASASKAN ALGORITMA PENJADUALAN GREEDYZERO ROUTE DALAM RANGKAIAN LOW OPTICAL HUBUNGANKAIT PERINGKAT

Oleh

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Satu kelas rangkaian saling berhubung dinamik adalah rangkaian saling berhubung berbilang paras (MINs) yang popular dalam aplikasi pensuisan dan komunikasi. Pada tahun-tahun kebelakangan ini, MINs telah dianggap penting kerana keberkesanan kos. Kemajuan dalam teknologi elektro-optik telah membuat peningkatan yang ketara dalam teknologi optik. Melahirkan idea pelaksanaan optik MINs untuk memenuhi permintaan yang semakin meningkat dalam aplikasi pengkomputeran komunikasi berprestasi tinggi, jalur lebar saluran tinggi, kependaman komunikasi yang rendah dan pemprosesan selari. Rangkaian saling berhubung berbilang paras optik (OMIN) adalah sangat popular dalam pensuisan, kapasiti penghantaran besar, dan komunikasi di kalangan lain-lain jenis rangkaian rangkaian saling berhubung. Persilangan OMINs berkaitan dengan suis optik, sebagai hasil gandingan yang tidak diingini dua isyarat dalam setiap elemen pensuisan.

Oleh itu, ia tidak mungkin memberi laluan lebih daripada satu mesej pada masa yang sama, tanpa sebarang persilangan antara elemen pensuisan di OMIN. Tesis ini memfokuskan kepada penyelesaian yang cekap untuk mengelakkan persilangan, dimana menggunakan laluan lalu lintas melalui rangkaian optik untuk mengelakkan gandingan dua isyarat dalam setiap elemen pensuisan.

Di bawah kekangan untuk mengelakkan persilangan, kami berminat untuk merealisasikan suatu pilihatur yang akan menggunakan bilangan minimum pas, masa pelaksanaan minimum dan jalur lebar maksimum kepada permintaan laluan input ke output tanpa persilangan. Banyak algoritma telah direka untuk melaksanakan penghalaan lebih baik. Kajian ini mengandungi dua pendekatan untuk menyelesaikan masalah peningkatan prestasi rangkaian. Pertama, seni bina baru Rangkaian Interkoneksi (Rangkaian Sambungtara Peringkat Rendah) dicadangkan untuk mengurangkan bilangan suis dan mengurangkan masa pelaksanaan manakala mengubahsuai bandwidth dan bilangan pas melalui transformasi peringkat rendah yang sama. Kemudian algoritma GreedyZero dibangunkan untuk meminimumkan bilangan pas kira-kira 30% di bandingkan dengan algoritma Sifar untuk laluan semua input kepada output tanpa persilangan di mana-mana. Algoritma GreedyZero telah dibentangkan di dalam Rangkaian Sambungtara Peringkat Rendah. Algoritma ini telah dibangunkan untuk mencapai matlamat prestasi dari segi pengurangan 50% dalam bilangan pas.

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I certify that a Thesis Examination Committee has met on 20 July 2012 to conduct the final examination of Mehrnaz Moudi on her thesis entitled "**Greedyzero-Based Scheduling Algorithm To Route In Optical Low Stage Interconnection Networks**" in accordance with Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1981. The Committee recommends that the student be awarded the Master of Science.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of **Master of Science**. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously and is not concurrently submitted for any other degree at Universiti Putra Malaysia or at any other institutions.

MEHRNAZ MOUDI

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TABLE OF CONTENTS