OPTIMIZED BURST ASSEMBLY ALGORITHM FOR MULTI-RANKED TRAFFIC OVER OPTICAL BURST SWITCHING NETWORK

OLA MAALI MOUSTAFA AHMED SAIFELDEEN

A dissertation submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Science (Computer Science)

Faculty of Computing
Universiti Teknologi Malaysia

OCTOBER 2014

This dissertation is dedicated to my mother, Fatooma, the one of the kind, for all the love and care she has always provided me, to the soul of my father, Maali, for all the virtues he planted in me, and to all members of my beloved family: Mohamed, Shaimaa, Moustafa and Asmaa for their endless support. Last but not the least to my niece , Limar, the fruit of Al-Maalis, for the way she brightens everyone's life.

ACKNOWLEDGEMENT

First and foremost, I would like to express heartfelt gratitude to my supervisor **Prof. Dr. Abdul Samad Ismail** for his constant support during my study at UTM. He inspired me greatly to work in this project. His willingness to motivate me contributed tremendously to our project. I have learned a lot from him and I am fortunate to have him as my mentor and supervisor

Besides, I would like to thank the authority of Universiti Teknologi Malaysia (UTM) for providing me with a good environment and facilities such as Computer laboratory to complete this project with software which I need during process.

ABSTRACT

Optical Burst Switching (OBS) is seen as the most vital technology for the coming era of Internet backbone infrastructure. The OBS cardinal role, especially for data of high priority belonging to real time systems, makes optimizing the OBS network one of the significant fields of research. Thus, OBS network fulfillment of all requisites and compulsions for optimized performance for all classes of traffic in terms of packet loss and end to end delay is a vital issue of study. This research presents a new optimized multi-class burst assembly algorithm over OBS network to ensure an enhanced performance via appropriate network service that could reduce packet loss rate and delay, especially for high priority classes of data, by the mean of preventing contention along OBS resources. A simulation model using National Chiao Tung University network simulator (NCTUns) simulator has been used to evaluate the performance of the proposed schemes, where the scheme is runned with three types of traffic: Constant Bit Rate (CBR), Variable Bit Rate (VBR) and Available Bit Rate (ABR). The traffic classes served by the proposed scheme can be extended to N number of classes, Where N value is calculated upon the burst size. The scheme is named Multi-Class Adaptive Burst Assembly (MC-ABA), and it represents an optimized version of the Real-Time Adaptive Burst Assembly (RT-ABA), where the MC-ABA not only serves N number of classes of Internet traffic over OBS networks but also considers the intensity of high priority data within each assembled burst to avoid contention and reduces packet loss and delay of high priority data over OBS core nodes. Simulation results showed that MC-ABA scheme could reduce the end-to-end delay and packet loss, besides providing suitable service for all types of data traffic. Generally, the proposed scheme can improve OBS network to be an appropriate environment for high priority traffic.

ABSTRAK

Pensuisan Letusan Optik (OBS) telah meningkat menjadi teknologi paling penting dalam era infrastruktur tulang belakang Internet. Peranan penting OBS, terutamanya untuk data berprioriti tinggi sistem masa nyata, menjadikan pengoptimuman rangkaian OBS sebagai satu bidang penyelidikan yang utama. Oleh itu, pemenuhan semua keperluan rangkaian OBS dan keperluan untuk memberi prestasi optimum kepada semua pengkelasan trafik dari segi kehilangan paket dan lengah hujung-ke-hujung adalah satu isu kajian yang penting. Kajian ini mencadangkan paradigm optimum berbilang kelas baru yang menjamin prestasi lebih baik melalui servis rangkaian bersesuaian antara semua kelas trafik yang dapat mengurangkan kadar kehilangan paket dan masa lengah, terutamanya untuk kelas data berprioriti tinggi, selain mempertingkatkan truput keseluruhan melalui penghalangan rebutan sepanjang sumber OBS. Satu model simulasi menggunakan pensimulasi National Chiao Tung University network simulator (NCTUns) telah dibangunkan untuk menilai prestasi skema yang dicadangkan, di mana skema dibangunkan dengan tiga jenis trafik: Kadar Bit Tetap (CBR), Kadar Bit Bolehubah (VBR) dan Kadar Bit Tersedia (ABR). Kelas-kelas trafik yang diberikan oleh skema yang dicadangkan boleh dipanjangkan kepada N bilangan kelas. Skema ini dinamakan sebagai Penghimpunan Letusan Adaptif Berbilang Kelas (MC-ABA), yang merupakan versi optimum Penghimpunan Letusan Adaptif Masa Nyata (RT-ABA), di mana MC-ABA bukan sahaja menyokong trafik berbilang kelas tetapi juga mengambilkira data berprioriti tinggi dalam himpunan letusan untuk mengelakkan perebutan dan kehilangan paket data berprioriti tinggi dalam nod teras OBS. Hasil simulasi menunjukkan skema MC-ABA mampu mengurangkan masa lengah hujung-ke-hujung,selain menyediakan servis yang sesuai untuk semua jenis trafik data. Secara umumnya skema yang dicadangkan dapat menambah baik rangkaian OBS untuk persekitaran yang sesuai dengan trafik berprioriti tinggi.