RATED WINDOW METHOD AND PACKET SIZE DIFFERENTIATION
SCHEME FOR TCP FAIRNESS IN IEEE 802.11 WLAN

By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfillment of the Requirement for the Degree of Master of Science

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DEDICATION

Thank you to my parents, my wife, my daughter, my supervisor and others...
Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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Faculty: Faculty of Computer Science and Information Technology

TCP unfairness issue has become pronounced in IEEE 802.11 WLANs due to the distributed coordination function (DCF) mechanism in the 802.11 MAC protocol. It introduces the per-flow and per-station fairness problem between uplink and downlink flows. The uplink flows generally dominate the downlink flows and station with more uplink flows obtains most of the system resources. With the existing of multi-rate capability in WLANs, another performance anomaly of 802.11 can be detected where the performance of a WLAN is determined by the stations with the lowest data transmission rates.

The objective of this research is to allocate fair proportional throughput among TCP flows of competing stations in IEEE 802.11 multi-rate infrastructure WLANs by distributing appropriate window and packet size according to the availability of
buffer size in the access point (AP). The research scenario focuses on the issue of fairness among stations having different numbers and directions of flow with vary of data transmission rates. In this work, a rated-window size method is performed by proportionally adjust the window size based on transmission rate of each flow. Each of the flow has its own window size and perfectly fit with the portion of available buffer size. Similar with the first method, the second scheme is proposed by manipulating the packet size of each station according to its physical transmission rate so that each station shared proportion bandwidth allocation.

The results of total throughput and fairness index are compared with previous methods. Proposed methods generate fair service in terms of proportional throughput among wireless stations. By getting appropriate fairness among each station in accessing WLAN infrastructure, a Wireless Internet Service Provider (WISP) significantly can increase its revenue by providing various service plans that have different service weights and service fees.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KAEDAH PENGKADARAN TETINGKAP DAN SKIM KEPELBAGAIAN SAIZ PAKET BAGI KEADILAN TCP WLAN IEEE 802.11

Oleh

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Isu ketidakadilan TCP semakin ketara bagi rangkaian setempat tanpa wayar (WLAN) IEEE 802.11 disebabkan oleh mekanisma fungsi penyelarasan teragih (DCF) dalam protokol 802.11 MAC. Ia mengakibatkan masalah ketidakadilan bagi per-aliran dan per-stesen antara aliran muat-naik dan aliran muat-turun. Aliran muat-naik secara umumnya mengatasi aliran muat-turun dan stesen dengan lebihan aliran muat-naik menguasai sebahagian besar sumber-sumber sistem. Dengan keupayaan kadar penghantaran data yang berbeza bagi WLAN, satu lagi anomali prestasi oleh 802.11 dapat dikesan di mana prestasi keseluruhan WLAN ditentukan oleh stesen yang mempunyai kadar transmisi data yang paling rendah.

Objektif kajian ini adalah untuk memperuntukkan kadar daya pemprosesan yang saksama di kalangan aliran TCP stesen-stesen yang bersaing dalam infrastruktur IEEE 802.11 WLAN yang mempunyai kelajuan penghantaran data yang berbeza
dengan mengedarkan saiz tingkap dan paket yang bersesuaian dengan setiap aliran mengikut tumpuan kepada setiap aliran yang mempunyai bilangan dan arah aliran yang berlainan serta kadar penghantaran data yang berbeza. Melalui kajian ini, kaedah pengkadaran saiz tetingkap dilakukan dengan mengagihkan saiz tetingkap secara saksama berdasarkan kadar penghantaran data bagi setiap aliran. Setiap aliran mempunyai saiz tetingkap sendiri bersesuaian dengan saiz semasa buffer. Seperti kaedah yang pertama, skim kedua yang dicadangkan memanipulasi saiz paket setiap stesen mengikut kadar penghantaran fizikal supaya setiap stesen berkongsi setiap peruntukan bahagian dalam sistem tersebut dengan saksama.

Keputusan jumlah daya pemprosesan dan indeks keadilan dibandingkan dengan kaedah-kaedah sebelumnya. Kedua-dua kaedah yang dicadangkan mencapai perkhidmatan yang adil dari segi keseimbangan jumlah daya pemprosesan antara stesen tanpa wayar. Dengan keadilan yang saksama antara setiap stesen dalam mengakses infrastruktur WLAN, WISP secara signifikan dapat meningkatkan pendapatan melalui penyediaan pelbagai perkhidmatan yang memiliki pakej dan bayaran perkhidmatan yang berbeza.
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I certify that an Examination Committee has met on 5 July 2011 to conduct the final examination of Tareq B. Rasul on his Master of Science thesis entitled “Rated Window Method and Packet Size Differentiation Scheme for TCP Fairness in IEEE 802.11 WLAN” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulation 1981. The Committee recommends that the candidate be awarded the relevant degree.

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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 other institutions.

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TAREQ B. RASUL

Date: 5 July 2011
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