UNIVERSITI PUTRA MALAYSIA

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

TAREQ B. RASUL

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

By

TAREQ B. RASUL

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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

July 2011

DEDICATION

Thank you to my parents, my wife, my daughter, my supervisor and others…

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

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

By

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July 2011

Chairman: Prof. Mohamed Othman, PhD

Faculty: Faculty of Computer Science and Information Technology

TCP unfairness issue has becomes 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

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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.

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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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Julai 2011

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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

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dengan mengedarkan saiz tingkap dan paket yang bersesuaian dengan setiap aliran mengikut ketersediaan saiz *buffer* di dalam pusat akses (AP). Senario penyelidikan memberi tumpuan kepada isu keadilan di kalangan stesen-stesen 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 signifikasinya dapat meningkatkan pendapatan melalui penyediaan pelbagai perkhidmatan yang memiliki pakej dan bayaran perkhidmatan yang berbeza.

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APPROVAL SHEETS

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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.

_____

TAREQ B. RASUL

Date: 5 July 2011

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TABLE OF CONTENTS

		Page
DEDICATION		ii
ABSTRACT		iii
ABSTRAK		v
ACKNOWLEDGEMENTS		vii
APPROVAL SHEETS		viii
DECLARATION		x
LIST OF TABLES		xiii
LIST OF FIGURES		xiv
LIST OF ABBREVIATIONS		xvi
CHAPTER		
1	**INTRODUCTION**	1
	1.1 Background and Motivation	2
	1.1.1 Multi-rate infrastructure wireless LANs	4
	1.1.2 Notion of fairness	5
	1.2 Problem Statement	6
	1.3 Research Objective	8
	1.4 Research Scope	9
	1.5 Research Contributions	10
	1.6 Organization of Thesis	11
2	**LITERATURE REVIEW**	13
	2.1 Introduction	13
	2.2 Congestion Control Mechanisms	13
	2.2.1 Different forms of congestion control	14
	2.2.2 TCP congestion control mechanisms	15
	2.3 Queue Management and Scheduling Methods	17
	2.3.1 Active queue management methods	17
	2.3.2 Fair scheduling methods	18
	2.4 Fairness in WLANs	19
	2.4.1 Per-flow TCP fairness	19
	2.4.2 Per-station TCP fairness	22
	2.4.3 Performance anomaly or per-rate TCP fairness	24
	2.5 Summary	27

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3	**RESEARCH METHODOLOGY**		29
	3.1	Introduction	29
	3.2	Network Simulator	29
	3.3	Simulation Steps	31
		3.3.1 Simulation design	31
		3.3.2 Configuring and running simulation	33
		3.3.3 Post simulation processing	34
	3.4	Simulation Process	35
	3.5	Performance Measurements	39
		3.5.1 Operation assumptions	40
		3.5.2 Performance metrics	41
	3.6	Summary	44
4	**RATED WINDOW METHOD AND PACKET SIZE DIFFERENTIATION SCHEME**		45
	4.1	Introduction	45
	4.2	Unfairness in Multi-Rate WLAN	46
	4.3	Rated Window Approach	51
		4.3.1 TCP performance on available buffer size in AP	51
		4.3.2 Rated Window model	53
		4.3.3 Proportional window allocator	54
	4.4	Packet Size Differentiation Approach	56
		4.4.1 Impact of packet size diversity	56
		4.4.2 Packet Size Differentiation scheme	57
	4.5	Results and Discussion	59
		4.5.1 Comparison of theoretical foundation with simulation model	60
		4.5.2 Fairness among stations with different transmission rates	62
		4.5.3 Fairness among stations having different transmission rates with different directions of TCP flow	67
		4.5.4 Fairness among transmission rates having different numbers of station	72
		4.5.5 Evaluation with UDP flows	77
	4.6	Summary	79
5	**CONCLUSION AND FUTURE RESEARCH**		80
	5.1	Conclusion	80
	5.2	Future Research	82
	REFERENCES		83
	BIODATA OF STUDENT		87
	APPENDIXES		88

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