PERFORMANCE ANALYSIS OF TFRC AND UDP OVER MOBILE-IP NETWORK WITH COMPETING FLOWS

Alhuzali Abed Ali R

UNIVERSITI UTARA MALAYSIA

2010

PERFORMANCE ANALYSIS OF TFRC AND UDP OVER MOBILE-IP NETWORK WITH COMPETING FLOWS

A thesis submitted to the Academic Dean Office in partial Fulfillment

Of the requirement for the degree Master of Science

(Information and Communication Technology)

Universiti Utara Malaysia

By

Alhuzali Abed Ali R

(803236)

KOLEJ SASTERA DAN SAINS
(College of Arts and Sciences)
Universiti Utara Malaysia

PERAKUAN KERJA KERTAS PROJEK
(Certificate of Project Paper)

Saya, yang bertandatangan, memperakukan bahawa
(I, the undersigned, certify that)

ALHUZALI ABED ALI R
(803236)

calon untuk Ijazah
(candidate for the degree of) **MSc. (Information Communication Technology)**

telah mengemukakan kertas projek yang bertajuk
(has presented his/her project paper of the following title)

PERFORMANCE ANALYSIS OF TFRC AND UDP OVER MOBILE-IP NETWORK WITH COMPETING FLOWS

seperti yang tercatat di muka surat tajuk dan kulit kertas projek
(as it appears on the title page and front cover of project paper)

bahawa kertas projek tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan.
(that the project paper acceptable in form and content, and that a satisfactory knowledge of the field is covered by the project paper).

Nama Penyelia Utama
(Name of Main Supervisor: **MR. FAZLI AZZALI**

Tandatangan
(Signature) : _____ Tarikh (Date) : 24/6/2010

Nama Penyelia Kedua
(Name of 2nd Supervisor): **MR.KHUZAIRI MOHD ZAINI**

Tandatangan
(Signature) : _____ Tarikh (Date) : 24/6/2010

PERMISSION TO USE

In presenting this project of the requirements for a Master of Science in Information and Communication Technology (MSc. IT) from Universiti Utara Malaysia, I agree that the University library may make it freely available for inspection. I further agree that permission for copying of this project paper in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence, by the Dean of Graduate School. It is understood that any copying or publication or use of this project or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my project paper.

Request for permission to copy or make other use of materials in this project, in whole or in part, should be addressed to:

Dean of Graduate School

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darulama

Abstract

This study aimed to conduct a performance analysis of TFRC and UDP over mobile-IP network with competing flows that enables to investigate three major performance metrics such as jitter, throughput, packet loss and packet delay. Two different transport layer protocols have been used in this analysis. As mobility has been the core issue of computing of 21st century, this research aims to contribute to this phenomenon by implementing performance analysis in mobile IP network, where mobile devices (nodes) are moved from access points to access points (AP) in order to exemplify the suitability of TFRC and UDP in wireless networking. Moreover to collect data about crucial performance metrics features. The experiment has been conducted by Network Simulation (NS-2).

Acknowledgments

Praise to Allah for his guidance and blessing for giving me the strength and perseverance to complete this project. I would foremost like to thank my parents, for providing me with the opportunity to pursue my goals and for their love and affection, which has helped me through the most trying times. Equal gratitude goes out to my siblings and brothers. I would like to thank my supervisors: Mr: Fazli bin Azzali and Mr. Khuzairi Bin Mohd Zaini for his guidance and constant motivation that has enabled me to complete my project work. Moreover, I would also like to thank him for the opportunities that he has made available to me.

Alhuzali Abed Ali / 18/5/2010

TABLE OF CONTENTS

CHAPTER THREE

RESEARCH METHODOLOGY

CHAPTER FOUR

SIMULATION RESULTS

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION FOR FURTHER STUDY

List of Figures

List of Tables

List of Abbreviation

APs	Access Points
BS	Base Station
CBR	Constant Bit Rate
CoA	Care of Address
DSL	Digital Subscriber Line
FA	Foreign Agent
HA	Home Agent
ISDN	Integrated Services Digital Network
IP	Internet Protocol
ITU	International Telecommunication Union
LAN	Local Area Network
MH	Mobile Host
Ns-2	Network Simulator 2
PC	Personal Computer
QoS	Quality of service
RTT	Round-trip delay time
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol over Internet Protocol
TFRC	TCP Friendly Rate Protocol
PDA	Personal Digital Assistant
UDP	User Datagram Protocol
VOIP	Voice Over IP
WAN	Wide Area Network

WLAN	Wireless Local Area Network
3G	Third Generation

CHAPTER ONE

INTRODUCTION

1.1. Introduction

As every significant research we are obliged to meet certain requirement in order to provide reliable studies. Different studies have focused on measuring and evaluation the performance of TCP in provide a particular importance which give inherent shared nature of Grid services and to the limited capabilities based on hardware and software tools that are typically available to satisfy a client's request. Moreover, measuring the performance on the online environments need always to apply an effective techniques for these measurements such as QoS for measuring the client's satisfaction on the online environments of e-Business and e-Science environments. Measuring the network performance has been reported different issues during measuring and elaborating the logical structure of the Network circuit. This kind of measurements addresses the abilities to provide much better services to a large extent (Orge, et al., 2004).

More specifically, the Transmission Control Protocol (TCP) is used by the users to adjust the sending rate in response to changing network conditions. In a network the computers communicates with the help of IP-address. In an organization the transmission of data has to be very much secured (Hayder, N., et al., 2008). The organizations may use Dynamic IP addressing (Mohd, D.,

The contents of the thesis is for internal user only

References

AB, Interpeak. (2005). Mobile IP, Home agent - Foreign Agent - Mobile Node. Stockholm: Interpeak.

Alex, C. (2000). An End-to-End Approach to Host Mobility. 6th ACM/IEEE International Conference on Mobile Computing and Networking, MobiCom 2000.

Ahmad, A. (2005). Wireless and mobile data networks. New Jersey: John Wiley & Sons.

Andreieux, A. (2005). Web Services Agreement Specification (WS-Agreement), work in progress, Grid Allocation and Agreement Protocol WG, GGF. Retrieved on 10 Sep 2009, from (HYPERLINK "http://www.gridforum.org/documents/GFD.107.pdf" www.gridforum.org/documents/GFD.107.pdf).

Banks, J., Nelson, B. L., & Nicol, D. M. (2005). Discrete-Event System Simulation. New Jersey: Pearson.

Best, R. (2003). Phase-locked loops: design, simulation, and applications. RR Donelly.

Charles, P., & David, B. (2000). Route Optimization in Mobile IP. Internet Draft (draft-ietf-mobileip-optim 10.txt, work in progress), November 2000.

Chun, W., Ann, T., & Cheng, S. (2002). Bi-directional Route Optimization in Mobile IP over Wireless LAN", in IEEE Vehicular Technology Society Fall Conference 2002.

Dommety, G., & Leung, K. (2001). RFC3115-Mobile IP Vendor/Organization-Specific Extensions. April 2001.

Elizabeth, M., & Belding, K. (2005). Mobile and Wireless communication networks. New York: Springer.

Ferguson, P., & Senie, D. (1998). Network Ingress Filtering: Defeating Denial of Service Attacks which employs IP Source Address Spoofing. RFC2267, January 1998.

Gupta, V., (1998). Solaris Mobile IP: Design and Implementation. SUN Microsystems Inc.

Hassan, M., & Jain, R. (2003). High Performance TCP/IP Networking: Concepts, Issues, and Solutions. Prentice-Hall.

Hayder, N., Zuriati, A., Mohamed, O., & Shamala, S. (2008). The TCPBased New AIMD Congestion Control Algorithm, International Journal of Computer Science and Network Security, VOL.8 No.10, 2008, 331-338. From www.paper.ijcsns.org/07_book/200810/20081051.pdf).

He, J., & Gary, S. (2004). TCP and UDP performance for internet over optical packet-switched networks. Journal of computer Networks.

Hoffer, J. (1999). Modern Systems Analysis & Design. MA: Addison-Wesley. Retrieved on 11 Sep 2009, from www.instructional1.calstatela.edu/dgadish/CIS%20520/CIS520_CH07.pdf).

Interpeak (2005). Mobile IP, Home agent - Foreign Agent - Mobile Node. Stockholm: Interpeak.

Johnson, D., & Perkins, C. (1998). Mobility Support in IPv6. Internet Draft 1998 http://mosquitonet.stanford.edu/mip/draftietf- mobileip-optim-08.txt

Johnson, J. (1998). Network Security Programs: Process and Metrics for the Real-World, White paper, Internet Security Systems, Inc. Retrieved on 18 Oct 2009, from (HYPERLINK "http://www.csulb.edu/journals/jecr/issues/20021/paper2.pdf" www.csulb.edu/journals/jecr/issues/20021/paper2.pdf).

Kozierok, C. M. (2005). The TCP/IP guide: a comprehensive, illustrated Internet protocols reference. San Francisco: No Starch Press.

Menth, M. (2000). Carrying wireless traffic over IP using real-time transport protocol multiplexing. 12th ITC Specialist Seminar, (Lillehammer, Norway).

Retrieved on 3 Sep 2009, from (www3.informatik.uni-wuerzburg.de/~menth/.../itc-ss12.pdf).

Miguel, S. (2005). TCP-Friendly Rate Control with Token Bucket for. Columbia University.

Mohd D., Nurhayati A. (2006). Performance Evaluation of TCP/IP Protocol for Mobile Ad Hoc Network. WSEAS Transactions on Computers, Vol.5, No.7, pp. 1481-1486. From (www.springerlink.com/index/l383326534733u52.pdf).

Muller, N. (2002). Desktop encyclopedia of telecommunications. New York: McGraw-Hill Telecom.

Montenegro, G. (2001). Reverse Tunneling for Mobile IP. RFC3024, January 2001.

Suresh, T. (1990). The nonspecific symptom screening method. Detection of nonpsychotic morbidity based on nonspecific symptoms. General Hospital Psychiatry, 12, 106 -114.

Stapp, M., & Rekhter, Y. (2000). Interaction between DHCP and DNS. Internet Draft (draft-ietf-dhc-dhcp-dns-*.txt, work in progress), March 2000.

Schneider, J., & Comroe, R. (2001). Motorola Canopy TM Access Point User's Guide.

Orge, (2004). Minimizing IP Connectivity Delay During Network (Re) Entry. IEEE C802.16e-04/151r1. Retrieved on 16 Oct 2009, from (www.ieee802.org/16/tge/contrib/C80216e-04_151.pdf).

Perkins,C. (2002). [RFC 3344] IP Mobility Support for IPv4. Ed. August 2002.

Perkins, C., & Johnson, D. (1999). Route Optimization in Mobile IP", Internet Draft 1999 (work in progress)http://mosquitonet.stanford.edu/mip/draft-ietf-mobileipoptim- 08.txt.

Pat, R., & Charles, E. (2001). DIAMETER Mobile IPv4 Applications. Internet draft (draft-ietf-aaadiameter- mobileip-07.txt, work in progress), July 2001.

Perkins, C. (2002). Mobile IP. 50th Anniversary Commemorative Issue , pp. Volume 35, Number 5. Perkins, C. (2002). RFC3344 - IP Mobility Support for IPv4. August 2002.

Qadan, O., Guizani, M., Rayes, A., Khan, B., & Al-Fuqaha, A. (2010). Network Modeling and Simulation: A Practical Perspective. West Sussex: John Wiley and Sons Ltd.

Li, D. (2006). Jitter Ratio Based TFRC Scheme In Wireless-Wired Hybrid Network.

Ramachandran, V., & Nandi, S. (2005). Detecting ARP spoofing: An active technique, Lecture Notes in COMPUTER SCIENCE 3803, pp.239-250. From (

HYPERLINK "http://www.springerlink.com/index/l421371736251342.pdf" www.springerlink.com/index/l421371736251342.pdf).

Mohamed, G., and Chin, T. (2003). Tommy M. McGuire, "Hop Integrity in Computer Networks", IEEE/ACM Transactions on Networking, Vol. 10, No. 3, June 2003.

Montenegro, G. (2001). [RFC 3024] Reverse Tunneling for Mobile IP, revised. Ed.. January 2001.

Nikander, P., Arkko, J., Aura, T., Montenegro, G., & Nordmark, E. (2004). Mobile IP version 6 Route Optimization Security Design Background. Internet Draft 2004, http://ietfreport.isoc.org/ids/draft-ietf-mip6-ro-sec-02.txt.

Rhoton, J. (2002). The wireless Internet explained. Digital Press. Retrieved from(http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=1698485&isnumber=35811).

Richard, M., Kalyan, S., & George, F. (2007). Network Simulation. Berkeley: Morgan & Claypool.

Rob, C. (2006). Wireless networking in the developing world. Limehouse Book Sprint Team.

Shlomi, G. (2009). publications. Retrieved february 2010, from EPFL: HYPERLINK "http://www.lpd.epfl.ch" http://www.lpd.epfl.ch .

Snoeren, A., & Balakrishnan, H. (2000). An End-to-End Approach to Host Mobility. In Proc. MOBICOM 2000.

Timo, D. H., Andy, D. P., Jarmo, T., & Stamatis, V. (2005). Embedded computer systems: architectures, modeling, and simulation. 5th International Workshop, SAMOS 2005 (pp. 385-390). Samos, Greece: Springer.

Varga, A., & Hornig, R. (2008). An overview of the OMNET++ simulation environment. Conference on simulation Tools and Techniques for Communication, Networks and Systems (SIMUTools 2008). Ahmad, A. (2005). Wireless and mobile data networks. New Jersey: John Wiley & Sons.

Weijia, J., & Wanlei, Z. (2005). Distributed network systems: from concepts to implementation, Springer.

Xiao, B., & Gao, C. (2006). Detection and localization of sybil nodes in vanets, in Proceedings of the Workshop on Dependability Issues in Wireless Ad Hoc Networks and Sensor Networks (DIWANS). Retrieved on 9 Sep 2009, from (www4.comp.polyu.edu.hk/~csbxiao/files/pub/sybil_acm-06.pdf).

Yongxiang, Z., & Chang, C. (2001). Coupon TFRC: a mechanism being friendly to both TCP and continuous stream.