Experimental Evaluation of Contention Window Selection Scheme and TCP Performance over 802.11 Ad Hoc Networks

林志驊、余心淳

E-mail: 9501986@mail.dyu.edu.tw

ABSTRACT

Due to the advantage in convenience and extensibility, the wireless ad hoc network has widely been used in almost all network environments to provide the multi-services in recent years. The IEEE 802.11 medium access control（MAC）protocol is originally designed to operate under the infrastructure-based WLAN networks, but it is not suited to ad hoc networks. Thus, for this reason, that causes the instability and unfairness of TCP flow over 802.11 ad hoc networks and further to debase the network efficiency. In this thesis, we attempt to enhance the TCP throughput performance without the significant modification of the selection scheme in the IEEE 802.11 distributed coordination function (DCF) contention window mechanism. The simulation results show that our proposed contention window selection policy outperforms other schemes under most different network topologies and environments. In addition, by comparing with the efficiency of different window selection schemes, we achieve to improve the TCP performance by increasing the flow stability in the 802.11 ad hoc networks.

Keywords : IEEE 802.11 ; ad hoc network ; distributed coordination function (DCF) ; contention window ; TCP throughput

Table of Contents

REFERENCES

[1]李雲、陳前斌、隆克平、吳詩其，“無線自組織網路中TCP穩定性的分析及改進”, 軟件學報, Vol. 14, No. 6, pp.1178-1186, 2003年.

[2]學貫行銷股份有限公司, W. R. Stevens,“TCP/IP Illustrated vol.1國際中文版”.

[3]Broch J, Maltz DA, Johnson DB, Hu YC, Jetcheva J.“A performance comparison of multi-hop wireless Ad Hoc network routing protocols”, The 4th Annual ACM/IEEE International Conference on Mobile Computing and Networking, ACM Press, pp. 85-97, 1998.

[4]Giuseppe Bianchi, Luigi Fratta, Matteo Oliveri“Performance Evaluation and Enhancement of the CSMA/CA MAC Protocol for 802.11 Wireless LANs”in Proc. IEEE PRIMRC, Oct, pp. 392-396, 1996.

[5]Giuseppe Bianchi“Performance Analysis of the IEEE 802.11 Distributed Coordination Function”IEEE Journal on Selected Areas in Communications, Vol. 18, No. 3, March, pp. 535-547, 2000.

[6]IEEE Standard. 802.11,“Part 11: Wireless LAN Media Access Control (MAC) and Physical Layer (PHY) Specifications”, http://standards.ieee.org/getieee802/, 1999.

[7]Josh Broch, David B. Johnson, David A. Maltz.,“The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks”, Internet-Draft, March, 1998.

[8]Kaixin Xu, Mario Gerla, Lantao Qi, Yantai Shu“Enhancing TCP Fairness in Ad Hoc Wireless Networks Using Neighborhood RED”, ACM MobiCom pp.16-28, 2003.

[9]Krishna Kanth T.,Sabeel Ansari, Anurag Kumar, and Mohammed H. Mehkri,“Performance Enhancement of TCP on Multihop Ad hoc Wireless Networks”IEEE International Conference on Personal Wireless Communications, 2002.

[10]O ’ REILLY, Mattbew S. Gast, “ 802.11 Wireless Networks:The Definitive Guide ” [11]Scalable Network Technologies Qualnet Version. 3.7, http:// www.scalablenetworks.com.
[12]Shugong Xua, Tarek Saadawi, “ Does the IEEE 802.11 MAC Protocol Work Well in Multihop Wireless Ad Hoc Networks? ” IEEE Communications Magazine, Vol. 39, pp.130-137, 2001.
[13]Shugong Xua, Tarek Saadawi, “ Revealing the problems with 802.11 medium access control protocol in multi-hop wireless ad hoc networks ”, ELSEVIER Computer Networks, Vol. 38, pp. 531 – 548, 2002.
[14]Yong Xiao, Xiuming Shan, Yong Ren, “ Game Theory Models for IEEE 802.11 DCF in Wireless Ad Hoc Networks ”, IEEE Radio Communications, March, pp. S22-S26, 2005.