TCP Performance over Geostationary Satellite Link

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INTRODUCTION

A significant amount of today's Internet traffic, including WWW (HTTP), file transfer (FTP), e-mail (SMTP), and remote access (Telnet) traffic, is carried by the TCP (Transmission Control Protocol) transport protocol [1]. Geostationary satellite links have a number of characteristics that may degrade the performance of TCP over it. The satellite links have an average RTT (round trip time) of around 500ms. The TCP uses the slow start mechanism to probe the network at the start of a connection. Time spent in slow start stage is directly proportional to the RTT and for a satellite link, it means that the TCP stays in slow start mode for a longer time than in the case of a small RTT link. This drastically decreases the throughput of short duration TCP connection. Furthermore, when packets are lost, the TCP enters the congestion control phase, and due to higher RTT, remains in this phase for a longer time, thus reducing the throughput of both short and long duration TCP connections.

TCP satellite gateways are proven to improve TCP throughput across high delay and lossy satellite links. The satellite gateways can improve TCP performance across stressed environments by breaking the end-to-end TCP connection into multiple transport layer connections [2].

RESULTS

To analyze the performance of the TCP satellite gateway, we conducted a variety of experiments using both the link emulator as well as the geostationary satellite link. We used the link emulator because of the limited testing time allowed with the satellite link and also because of the flexibility. The results demonstrate that improvements can be made to enhance the performance of TCP over satellite links through the satellite gateways. On the average, the satellite gateways introduce the significant improvement of up to 300 – 800 % in throughput.

References

[1] T. R. Henderson, and R. H. Katz, "Transport Protocols for Internet-Compatible Satellite Networks", IEEE Journal on Selected Areas of Communications, Vol. 17, No. 2, pp. 345-359, February 1999.
[2] K. Scott, P. Feighery, B. Crow, and M. Jurik, "TCP congestion control in shared satellite environments", MILCOM 2002 - IEEE Military Communications Conference, no. 1, October 2002, pp. 46 – 50.