International J.of Multidispl.Research & Advcs. in Engg.(IJMRAE),
ISSN 0975-7074, Vol. 2, No. III (October 2010), pp. 455-465

IMPROVED COST EFFICIENCY OF TCP IP OVER WIRELESS LINKS

PREMTOSH MAJUMDAR AND RANGANATHAN V.

Abstract

To facilitate the merging of wireless access technologies and the traditional Internet, the core protocols for data communication should be robust and have low overhead. In this thesis, we propose refinements to the Transmission Control Protocol (TCP) that improve its cost efficiency over wireless links. TCP is unable to distinguish between congestion and error induced losses, reordered, or delayed segments. A reordering robust TCP would make it possible to simplify network elements, now performing explicit actions to prevent reordering, and open up for deployment of new technologies that naturally cause reordering. We propose TCP-Aix; a set of TCP modifications that improves the robustness of TCP to reordering and delay spikes. TCP-Aix decouples loss recovery and congestion control actions. We also present an algorithm called the winthresh algorithm for computing a duplicate acknowledgment threshold based on TCP buffer space and current send window size. The results show that TCP-Aix with the winthresh algorithm is able to maintain almost constant performance even in scenarios frequently displaying long reordering durations. It is also fair towards competing standards-compliant TCP flows. In wireless networks, where the links out of efficiency constraints are more error prone than wired links, the error and the reordering sensitivity of TCP have motivated link layer protocols that perform retransmissions and enforce in-order delivery. We investigate the potential gains of using a reordering robust TCP, like TCP-Aix, with a wireless link layer that allows out-of-order delivery, compared to using in-order delivery with a standards-compliant TCP. We found that the smoothness of TCP is strongly affected by the link layer configuration. In-order delivery leads to burstier traffic and larger network layer buffering needs, than out-of-order delivery and TCP-Aix.