

# Improve TCP Performance in Ad Hoc Networks

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## Abstract

Standard TCP misinterpret mobility loss in Ad hoc network as congestion loss, thus, it reduce the TCP performance by invoking unnecessary congestion control action. In this paper, we propose two approaches, simELFN (an variation of TCP-ELFN) and TCP-FSR (an variation of TCP-F). They can distinguish the essence of packet loss and avoid multiple consecutive *dupACKs*. Analyses and simulations show that they can achieve better TCP performance in Ad hoc network.

**Keywords:** *Ad hoc Networks; simELFN; TCP-FSR; TCP performance.*

## 1 Introduction

Ad hoc network is a novel wireless network model, which is an autonomous system of a group of mobile routers, and associated hosts, connected by wireless links. The union of these wireless links can form an arbitrary graph<sup>[1]</sup>. Nodes within each other's radio range can communicate with each other directly via wireless links, while those far apart can talk to each other in a multi-hop routing fashion by using other nodes as relays. With the popularity of mobile computing device and wireless network, the research of ad hoc network has attracted much attention recently. Most works were focused on the development of routing protocols because of the importance of 'routing', and not much attention was paid to the improvement of TCP performance over Ad hoc network, albeit in fact, it may enhance the network performance dramatically, which will be shown latter in this paper.

TCP, which provides application layer with reliable connection-oriented packet transmission service over an unreliable underlying IP layer, is a vital component of the Internet protocol suite. Presently, TCP used in Internet, which is referred as standard TCP<sup>1</sup> in this paper, is designed for wireline network. It assumes that all packet losses are due to the network congestion, and immediately invokes congestion control action to alleviate the congestion by reducing sending rate when it detects a packet loss. In other words, standard TCP cannot distinguish congestion from packet loss due to transmission errors or route failures. Standard TCP can work efficiently in wireline network since the latter situations happen very rarely there.

Nevertheless, on the other hand, in an Ad hoc network, data packet losses happen frequently. This is partially due to its using error-prone wireless links as transmission medium. The effect of these packet losses can be reduced by using reliable link layer protocols<sup>[2]</sup>. However, there is another reason of packet loses which is much harder to deal with: the route failure, which occurs frequently and unpredictably during the lifetime of a transport session, due to the relative motion of nodes in Ad hoc network. During the period of route failure, none of the data packets can reach

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<sup>1</sup> In this paper, 'standard tcp' is Reno.