[5A-5]

The Relation between TCP/IP Packet Size and Throughput for Wireless ATM Links

Ha Cheol Lee
Dept. of Information and Telecomm., Yuhan College
hclee@yuhan.ac.kr

Abstract

This paper provides optimum packet size that maximize the throughput efficiency of TCP/IP traffic as a function of data packet length for several values of channel BER over wireless ATM(Asynchronous Transfer Mode) links applying data link error control schemes to reduce error problems encountered in using wireless links. For TCP/IP nondelay-sensitive traffic requiring reliable delivery, it is necessary to adopt data link layer ARQ(Automatic Repeat reQuest) protocol. ARQ error control schemes considered include GBN(Go-Back-N) ARQ and SR(Selective Repeat) ARQ.

1. Introduction

ATM technology will have an important role in the future evolution of global communication networks. while ATM results in considerable advantages (less overhead, increased throughput) in an optical network, it also causes severe problems when ATM data is transmitted over an error-prone channel, wireless channel as shown in Fig. 1[1]. The protocol layers in an ATM network were designed with the assumption of a very high quality data link. This is true not only of ATM, but also of TCP which is often used above ATM to provide reliable delivery. Many widely used applications use either TCP or UDP. TCP causes severe problems when used over noisy links. ATM cells corrupted by channel errors will result in packet discards at the AAL5 layer which will trigger the need for retransmissions by the TCP protocol[2]. This, in turn, will invoke congestion control mechanisms within TCP under the assumption that the lost packet was due to a congested network. The invocation of congestion control will lead to a potentially significant reduction in throughput. Recently, several schemes have been proposed to alleviate the effects of non-congestion-related losses over wireless non-ATM links. These schemes include radio link protocols[2], fast retransmission, and split-TCP connection. So, for TCP/IP nondelay-sensitive traffic requiring reliable delivery over wireless ATM links, it is also necessary to adopt data link layer ARQ protocol in order to make the physical layer as SONET-like as possible[2]. Thus, J. Bibb Cain's paper analyzed GBN ARQ performance over wireless ATM links[2]. In addition to GBN ARQ scheme, this paper considers SR ARQ scheme. TCP/IP transport architecture over wireless ATM links is suggested in section 2. Section 3 provides optimum packet size that maximizes the throughput efficiency of TCP/IP traffic as a function of data packet length for several values of channel BER over wireless ATM links applying data link error control schemes to reduce error problems encountered in using wireless links. Section 4 concluded with remarks.

2. TCP/IP Transport over Wireless ATM Links

An illustration of the basic TCP/IP over ATM protocol stack is provided as Fig. 1. ATM adaptation