

Congestion Control For MPEG Video Services Over ATM Networks

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Abstract. As multimedia services become popular with the increasing availability of broadband accesses, congestion control in B-ISDNs using ATM for multimedia services becomes more important. In this paper, the congestion control for video transmission over ATM networks is investigated. One of the most common compression methods for video services is MPEG compression, which reduced the bandwidth requirement. However, problems like cell losses in ATM networks due to congestion have to be resolved. For real-time traffic such as MPEG video data, re-transmission of any lost cells are ineffective. Using priority bit for protecting important cells is a method to improve overall performance. This paper proposes a congestion control method for MPEG video over ATM networks, which requires the source to dynamically change the priority of P-frame cells according to the network congestion level. With one priority bit, our method implements a 3-level priority system. That is, the I-frame cells have the highest priority, P-frame cells have the medium priority and B-frames cells have the lowest priority. Hence the quality of MPEG video over ATM networks can be improved. In order to investigate the performance of our method, simulations are performed using model-based traffic sources and real video sequences. Moreover, the viewing quality of real video sequences with different congestion control methods are subjectively tested. The performance bounds of our method are found analytically using a histogram model. It is observed that the most important frames, I- and P- frames, are well protected as their cell loss ratio are very close to their lower bounds.

Keywords. Video, ATM, VBR, Priority, Congestion Control.

1 Introduction

Asynchronous Transfer Mode (ATM) is a part of the Broadband Integrated Services Digital Networks (B-ISDNs) specification to provide for convergence, multiplexing, and switching operations. ATM uses fixed length packets, which are called “cells”. The length of each cell is 53 bytes, which includes 5 bytes for cell header. ATM networks support constant bit rate (CBR),