

Relations between ATM traffic parameters and quality of multimedia transmission – an experimental approach

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Abstract — In the paper, we present the results of research of MPEG-2 streams transmission through CBR and VBR channel in ATM network. We applied not only experimental and measurement methods but analytical ones as well. A description of the proposed measurement station includes: installed hardware, created software and prepared experimental data. Next, we present the applied measurement method. In the following section, we define a term of the quality of multimedia transmission. The measurement results were compared with the results of the analytical station model. We proposed a functional description of dependence between ATM traffic parameters, video stream bit rate, and quality of multimedia transmission.

Keywords — multimedia transmission, quality of service, traffic parameters, MPEG-2, ATM, CBR and VBR.

1. Introduction

Applications of real-time multimedia services like videoconferences or video on demand has been lately widely discussed. Such services require much more bandwidth than traditional data transmissions. In the case of multimedia transmissions, besides the bandwidth, the important factors are: low loss rate, bounds of end-to-end delay, and delay variation. On the other hand, a lot of users should share network resources. Network operators ought to find a compromise between a number of users and quality of transmission.

Network technology employed to real-time multimedia transmission has to guarantee quality of service (QoS). Currently, the only one native technology assuring QoS on a large topographically area is asynchronous transfer mode (ATM). There are two categories of services in the ATM for real-time communication: constant bit rate (CBR) and variable bit rate (VBR). The both categories are described by combination of traffic parameters and QoS parameters called a traffic descriptor. The CBR traffic descriptor is simpler than the VBR traffic descriptor but the VBR category is potentially more efficient than its CBR counterpart in terms of network resources utilization. Additionally, the traffic descriptors are not always easy to understand clearly for end users who pay operators for their services. Moreover, it is difficult to predict traffic descriptors of encoded multimedia streams.

In this paper we propose an application of relative simple functional dependencies for efficiently bandwidth manage-

ment in ATM networks. The obtained dependencies were drawn from experimental results. In our experiments we transmitted MPEG-2 streams both in CBR and in VBR ATM channels. The MPEG-2 streams were classified into various categories. Moreover, we made an analytical model of the station to compare with measurement results. The found dependencies can be an alternative for complex analytical and statistical models.

2. Testbed and samples of streams

The experimental research was performed on a testbed configured in the Laboratory of Computer Multimedia Systems at the Institute of Theoretical and Applied Informatics of PAS. The station included the server providing video on demand service, three workstations as clients of this service with prepared measurement software and an ATM network analyser. The components were connected through an ATM network built with three switches. Samples of multimedia streams we prepared on the encoding workstation with a built-in real-time MPEG-2 coder. The schema of the station is shown in Fig. 1.

