Performance Studies of Voice and Video Conferencing over ATM and Gigabit Ethernet Backbone Networks

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ABSTRACT

This research paper compares two popular backbone network technologies—Gigabit Ethernet and Asynchronous Transfer Mode (ATM). ATM has been a popular choice for years for providing multimedia applications over the network effectively by making use of its features like Quality of Service (QoS). Gigabit Ethernet matches ATM’s functionality by providing higher bandwidth at lower cost, less complexity and easier integration into the existing Ethernet technologies. Hence, it becomes important to compare these two technologies against various network performance metrics to find out which technology performs better for what type of applications under what circumstances. This research paper will analyze and compare the performance of those two technologies based on the throughput, end-to-end delay for Voice and Video conferencing and jitter for the Voice applications. For this purpose, two different simulations were created, one for the Gigabit Ethernet and the other one for the ATM network, using the popular commercial and academic simulation software – OPNET modeler.

Keywords: Asynchronous Transfer Mode, Gigabit Ethernet, OPtimized Network Engineering Tools (OPNET) Modeler, Quality of Service, Video, Voice

1. INTRODUCTION

For the purpose of creating a simulation model, two different researches were using an OPtimized Network Engineering Tools (OPNET) modeler 16.0 (Hasan, Yu, Griffiths, & Yang, 2007; Xia, Li, & Wan, 2008; Sidhu & Yin, 2007), One research consisted of Gigabit Ethernet network and the other one consisted ATM network. Gigabit Ethernet networks is a Data Link and Physical Layer technology over Transmission Control Protocol (TCP) and Internet Protocol (IP) and as such it requires no changes to higher layer protocols over network. Furthermore the
use of Ethernet at 10/100/1000 Mbps allows faultless integration among desktop, workgroup, and campus interconnections, while ATM requires ATM LAN Emulation (LANE) to communicate legacy networks (Schreiber, Joopari, & Rashid, 2005). This paper will initially describe the network model created for the purpose of simulation. It will be followed by the analysis of the simulation results to compare Gigabit Ethernet and ATM network based on the performance metrics mentioned above. The next section will describe how the results that are obtained from the simulation are validated. This will be followed by the reflection on the self-learning by undertaking this simulations study and research will end with the summary of this research paper.

Gigabit Ethernet, according to Willebeek-LeMair and Shae (1997), Pazos et al. (2000), Frazier and Johnson (1999), and Hurwitz and Feng (2004) has been in the spine use for a number of years competing with the ATM switches network. Both of these networks were configured to be spread over an area of one mile* one mile. To be able to compare the two technologies effectively, same number of workstations and intermediary devices were used in both the researches (Nisar et al., 2010). There were 10 different scenarios created in each research. The first scenario in each research consisted of 4 host workstations connected via two switches. The number of workstations was incremented by 4 in each subsequent scenario. The 10th scenario consisted of 40 workstations. Figure 1 and Figure 2 show the last scenarios from both the study. All the workstations from both the researches were configured to generate both voice and video conferencing applications traffic simultaneously.

Voice and Video applications were defined in the “Application Config” (shown in the left-hand bottom corner in Figure 1 and Figure 2) and the workstations’ profile to generate the traffic was defined in the “Profile Config” (next to Application Config in Figure 1 and Figure 2). In Gigabit Ethernet research, the workstations were connected to the switch via 100baseT cables. The switches were connected to each other using 1000BaseX cables. In ATM research, the cables between the workstations and the

![Figure 1. Gigabit ethernet network](image-url)
Not Just Videogames: Gamification and its Potential Application to Public Services
www.igi-global.com/chapter/not-just-videogames/110279?camid=4v1a