Modeling and Performance Studies of ATM Networks Over Voice and Video

Kashif Nisar, Auckland University of Technology, Auckland, New Zealand, & Universiti Utara –Malaysia, Sintok, Kedah, Malaysia

Nurul I. Sarkar, Auckland University of Technology, Auckland, New Zealand

ABSTRACT

The Advanced Network Technologies is a research that investigates the technology(s) behind today's modern networks and network infrastructures one of these technologies being Asynchronous Transfer Mode (ATM). Therefore, also focuses its attention on ATM. Dubbed “Modelling and Performance Studies of ATM Networks” ; this research seeks to look at, and into, the impact of application segment length on the performance of an ATM network and the impact of traffic type data on the performance of an ATM network. To be able to examine an ATM network, we need to be able to simulate it somehow. This research, the authors have used the OPNET Modeler 14.0 simulation tool to create a network model that represents a real-life ATM network. And by actually simulating an ATM network at AUT University New Zealand, they can therefore change certain variables, and observe the effects the changes have on performance. As stated above, one of the impacts that will be explored is the effect that application segment length has on an ATM network. Thus, one variable that will be changed in our simulation is the segment length. This is the length of each packet segment that is sent through the network for a particular traffic type. The second impact to be inspected is the impact of different traffic types on an ATM network. For example, voice & video traffic should theoretically affect an ATM network

Keywords: Asynchronous Transfer Mode, Modelling, OPtimized Network Engineering Tools (OPNET) Modeler, Video, Voice

1. INTRODUCTION

Our research on ATM model is based on the ATM model that we built in our research paper. The model is explained in-depth below. Figure 1 shows the fundamentals of VoIP protocol stack architecture to implement a VoIP network system over WLANs (Chong & Matthews, 2004; Lindgren, Almquist, & Schelen, 2002).

Voice packets are transmitted over IP-based networks. VoIP is a real-time application and transmits the voice on a Real-Time Transport Protocol (RTP), User Datagram Protocol (UDP) and Internet Protocol (IP) over networks (Cai, Ling, Shen, Mark, & Cai, 2009). Each voice packet is small in size and the voice packet has the headers: RTP (12 bytes), UDP (8 bytes), and IP (20 bytes) headers. The data-link layer
Medium Access Control (MAC) has a (34 bytes) header. All these headers sum up to 74 bytes of overhead in the VoIP application. The Session Initiation Protocol (SIP) was considered to handle a multimedia call setup and H.323 is considered by ITU to allocate IP-based phones on the public telephone network to talk to a PC-based phone over IP-based networks (Ehlert, Zhang, & Magedanz, 2008). It is a standard that specifies the components, protocols and procedures for multimedia communication services such as real-time audio, video and data communications over IP-based packet networks (Hasbullah, Nisar & Said, 2009; Nisar, Said & Hasbullah, 2010).

Figure 1 shows the components and subsequent layout of the NorthWest subnet. Each of the subnets has identical components and layout as that of the Northwest subnet. Each has 2 ATM Voice client workstations, 2 ATM Video client workstations, 2 ATM Data (Email & FTP) client workstations, a central ATM cross connection switch, and an ATM server. Each client is connected individually to the central switch; and so is the server. These links are also all full-duplex ATM connection links. The central switch is then also connected to the network outside of the subnet. As stated each subnet is connected to a switch, so the central switch inside the subnet thus is connected to one of the central switches outside of the subnet (E.g. CentralWest switch). This connection is also made via a bidirectional ATM link. Thus, altogether, there are 8 links being utilised within a subnet.

Figure 2 shows the high-level perspective of the ATM model that was produced in research Lab. The model consists of 8 main components: 2 central ATM cross connection switches, 4 subnets, an application config and a profile config.

As shown in Figure 2, the subnets are each connected to one of the cross connection switches (NorthWest & SouthWest to the CentralWest switch; SouthEast & NorthEast to the CentralEast switch). Both central switches are then connected to each other; utilising a total of 5 links altogether. These links are all full-duplex (bidirectional) ATM connection links. The application config “Applications” houses the definitions for all the applications that will be used in our model. In our research Lab ATM model three definitions have already been setup; these are definitions for Email, FTP,
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