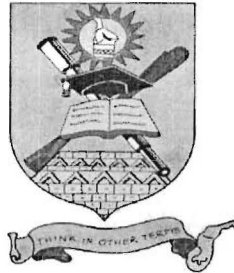# NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

Techniques for Construction of Reliable high bandwidth Multimedia Networks based on Open/Free Source Software to support E-learning

By

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Abstract

Reliable high bandwidth multimedia computer networks have become in recent years an important part of higher education research, learning as well as in bridging the digital divide. Improved networking not only permits an increase in the volume or speed of transmission, but also encourages the development of new research methods, new directions in research and new developments in the delivery of higher education e.g. in the use of E-learning platforms and management of high volumes of data. It is therefore important for academic institutions to adopt high-speed broadband networks in order to facilitate their research, teaching and learning based on E-learning platforms as well as in performing their day-to-day operations. Congestion and poor computer network performance occurs at many points on a computer network during transmission. Another challenge met by most academic institutions especially those relying mostly on State funding is inadequacy of funds to procure and maintain world-class transmission media that would render high quality of service. Therefore some academic institutions consider the special privileges granted to them by Open Source Software/Free Source (OSS/FS) whose advantages to users are that, they can have access to the source code, may modify the software to suit their needs, or redistribute the software as they deem fit. Analysis of existing uses of high bandwidth multimedia networks was carried out as well as their possible applications in supporting E-learning. These application techniques provided a background to and better understanding of the construction of reliable high bandwidth multimedia networks based on Open/Free source software best suited for institutions of higher learning. A mathematical method borrowed and adapted from the Decision Sciences (DS) and heuristics was then used in the analysis of techniques in the construction of reliable high bandwidth multimedia computer networks subject to constraints we called metrics. A prototype of a four-computer network running on a combination of both proprietary operating system software (MS Windows XP) and Open/Free Source operating system software (Ubuntu) was then set-up. A Free Source application software performance monitor and an Internet Protocol (IP) network browser was then used to track network latency, packet loss, traffic and bandwidth usage, and gather many other network statistics in the evaluation of the designed network. Most importantly results obtained showed that traffic on a network should be streamlined in such a way that would give optimum service especially at peak periods so as to reduce congestion. Secondly results obtained showed that attention has to be focused on the capacity (i.e. speed of network adapter cards and speed of transmitting medium) and quality (i.e. related to the type of computers and cables being used in a network) of the network infrastructure at all sites, such as academic institution campuses, where end-users work, as well as to the capacity of the national network and the international connections in order to achieve reliable internet connectivity. However the research could not ascertain how the network would behave as more and more computers are added into the network. In these circumstances there will be a need to use discrete event simulation methods using appropriate software in the evaluation of the designed network. The most important techniques in the construction of a network are those that maximise the use of the bandwidth and thus increase throughput of multimedia networks that will give a very high quality of service, as academic institutions are increasingly dealing with and sending large volumes of voice, data, images and video over their networks.