AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics and Communications Engineering Department

A Thesis

Submitted in partial fulfillment of the requirements of the degree of

Master of Science in Electrical Engineering

Enhancing Multimedia Traffic Performance over MPLS Networks

Submitted by

Ahmed El Sayed Fathy Ahmed Abd El Latif

B.Sc. of Electrical Engineering

(Electronics and Communications Engineering)

Military Technical College, 1992

Supervised By

Prof.Dr. Salwa Hussein Elramly

Dr. Hussein Abd el Aaty El sayed

Cairo 2014

AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

CAIRO-EGYPT

Name: **Ahmed El Sayed Fathy Ahmed Abd El Latif**

Thesis title: **"Enhancing Multimedia Traffic Performance over MPLS Networks".**

Degree: **Master of Science in Electrical Engineering (**Electronics & Electrical Communications Engineering Department).

EXAMINERS COMMITTEE

Name	Signature
Prof. Hebat-Allah Mostafa Mourad Electronics&Electrical Communications Eng. Dep. Faculty of Engineering - Cairo University	.....
Prof. Hadia Mohamed El Henawy Electronics&Electrical Communications Eng. Dep. Faculty of Engineering - Ain Shams University	.....
Prof. Salwa Hussein El Ramly Electronics & Electrical Communications Eng. Dep. Faculty of Engineering - Ain Shams University	.....

Date: / /

STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Electrical Engineering (Electronics and Communications Engineering).

The work included in this thesis was carried out by the author at the Electronics and Communications Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

No part of this thesis was submitted for a degree or a qualification at any other university or institution.

Name: Ahmed El Sayed Fathy Ahmed Abd El Latif

Signature:

Date:

Curriculum Vitae

Name of Researcher:	Ahmed El Sayed Fathy Ahmed
Date of Birth:	20/11/1969
Place of Birth:	Cairo, Egypt
First University Degree:	B.Sc. in Electrical Engineering
Name of University:	Military Technical College
Date of Degree:	June 1992

ABSTRACT

One of the most crucial problems in the Internet has been the quality of service (QoS) provisioning. Multiprotocol Label Switching (MPLS) technology guarantees real time and multimedia applications QoS using different resource allocation techniques. Also MPLS contributes high scalability in data network.
Today's IP networks are being enhanced using MPLS to carry multimedia traffic. MPLS technology has proven itself in providing QoS and seamless integration with the existing huge IP networks. This thesis aims to evaluate MPLS performance based on multimedia service average throughput, total number of packets received, end to end delay, jitter, and packet loss ratio using OPNET simulator. It also compares MPLS network performance to that provided by IP networks. This study shows the scalability of MPLS by simulating small and large networks under different loading conditions. The simulation also shows the performance of different MPLS QoS configurations.

Also, this thesis illustrates the multimedia traffic performance enhancement by investigating three different scenarios using OPNET simulator since it's almost impossible to convert the entire IP networks to a newer technology. Those scenarios are full IP network, full MPLS network, and hybrid IP/MPLS network. The simulation results point up the pros and cons of each scenario in terms of end-to-end delay, delay variation, packet loss ratio, packet delivery ratio, and voice MOS value. In short, full MPLS network provides the best performance for multimedia traffic but close results can be achieved using hybrid IP/MPLS network.

Key words: MPLS, QoS, TE, MPLS TE, MPLS DiffServ TE.

ACKNOWLEDGEMENT

All praise is due to Allah, Most Merciful, Lord of the Worlds, Who taught man what he knew not. I would like to thank God Almighty for bestowing upon me the chance, strength and ability to complete this work.

I would first like to thank my supervision committee Prof.Dr. Salwa Hussein Elramly and Ass.Prof. Hussein Abd el Aaty El sayed for their great help and dedication through the duration of this work. I learned so many valuable things from them, but above all, they taught me how to be devoted to research and how to help others. I am in great debt to Prof.Dr. Adel El Henawi, Eng. Ahmed Talaat, Eng. Rofida, Eng. Mohamed Omar, and Eng.Sara Hassan for their great help during my study in Ain Shams university.

I would also like to thank Ass. Prof. Col. Ahmed Hafiz for his continuous support and enthusing help and very helpful comments during work and thesis writing. And Eng. Ahmed yousry, Eng. Ismail Kamal, and Eng. Abd-elrahman Elakhdar from Egyptian Armed Force for their support and encouragement.

Last but not least, I would like to thank my wife and my mother. Their patience, care, and love are what guided me through whole life.

Contents

List of Figures

List of Tables