

**IMPROVE NETWORK PERFORMANCE BY ENABLING EXPLICIT  
CONGESTION NOTIFICATION (ECN) IN SCTP CONTROL CHUNKS**

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**UNIVERSITI UTARA MALAYSIA**

**2008**

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# **IMPROVE NETWORK PERFORMANCE BY ENABLING EXPLICIT CONGESTION NOTIFICATION (ECN) IN SCTP CONTROL CHUNKS**

A thesis submitted to the College of Arts and Sciences in partial  
Fulfillment of the requirement for the degree  
Master of Science (Information Technology)  
Universiti Utara Malaysia

By  
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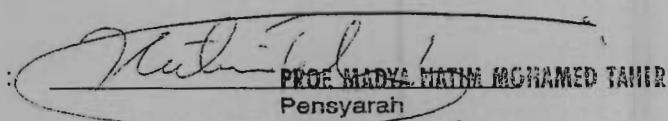
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## ACKNOWLEDGEMENTS

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ  
”يرفع الله الذين امنوا منكم و الذين اوتوا العلم درجات“ صدق الله العظيم

IN THE NAME OF ALLAH  
THE ALL-COMPASSIONATE, ALL-MERCIFUL

*At first, from my deepest heart, I must thank the world's great creator "Allah" for everything he gave to me and to his human beings.*

From my deepest heart, I proudly would like to thank my Supervisor **Associate Prof. Dr. Hatim Hj. Mohd. Tahir** for his wonderful and great encouragement. and support for this challenge. His patience, guidance, motivation and comments have supplied me with a valuable and strong knowledge during this hard mission. And for his wonderful effort in guiding me to efficiently reach to where I am now.

*I would like to thank my lovely dear parents, my kind hearted father Mr.Jamil Elhalabi and my sweet lovely mother Sahar Elhalabi with their eternity love. From my deepest heart I would like to thank them for how they are in eager to reach me to where I am now. Really, without their prayers, patience, understanding, support, encouragements and care, I would not have been able to be where I am.*

I am also so grateful to my lovely and dearest siblings, Nour, Ahmed, Farah, Yazeed, and Mahmoud for their high support and understanding during my studies.

*Special thanks go to my Uncle Saeed Elhalabi and his wife my lovely aunt Huda Elhalabi , for their wonderful encouragements and support .*

I also would like to thank my best close friends *specially my friends Amjad, Ayman, Rafeek and Amin* for their wonderful encouragements and support during my studies.

I also would like to thank all my relatives whom have stood beside me and kept encouraging me during my studies.

Finally, I would like to dedicate this work to my lovely parents.

## ABSTRACT

Recently in communication community, and because of the need to a reliable transmission protocol, that can cover the Transport Control Protocol (TCP) and User Datagram Protocol (UDP) lacks, the Internet Engineering Task Force (IETF) defined a new protocol called Stream Control Transmission Protocol (SCTP). As new as SCTP is, as important to do experiment on it, therefore, this dissertation proposes adding Explicit Congestion Notification (ECN) mechanism into SCTP chunks (INIT chunk, and INIT-ACK chunk) to improve the delay of transferring important data during congestion, where illustrates the benefit of SCTP compared with the previous protocols Transmission Control Protocol (TCP) and User Datagram Protocol (UDP), then discuss the details of adding ECN, and the reason behind Random Early Detection (RED) choice. Through the experimental analysis, we compare SCTP enabled ECN in INIT-ACK chunk to SCTP non ECN enabled in INIT-ACK chunk, and demonstrate the result of ECN impact on SCTP delay time.

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## LIST OF ABBREVIATIONS

<b>AQM</b>	Active Queue Management
<b>COOKIE ACK</b>	Cookie Acknowledgement
<b>COOKIE ECHO</b>	State Cookie
<b>cwnd</b>	Congestion Window
<b>CWR</b>	Congestion Window Reduced
<b>D</b>	Delay flag (TCP)
<b>ECN</b>	Explicit Congestion Notification
<b>FTP</b>	File Transfer Protocol
<b>HEARTBEAT</b>	Heartbeat Request
<b>HEARTBEAT ACK</b>	Heartbeat Acknowledgement
<b>HOL</b>	Head-of-line
<b>IETF</b>	Internet Engineering Task Force
<b>INIT</b>	Initiation
<b>INIT ACK</b>	Initiation Acknowledgement

<b>MTU</b>	Maximum Transfer Unit
<b>OSI</b>	Open Systems Interconnection
<b>QoS</b>	Quality of Service
<b>RTT</b>	Round Trip Time
<b>SACK</b>	Selective Acknowledgement
<b>SCTP</b>	Stream Control Transport Protocol
<b>SHUTDOWN</b>	Shutdown
<b>SHUTDOWN ACK</b>	Shutdown Acknowledgement
<b>SHUTDOWN COMPLETE</b>	Shutdown Complete
<b>TCP</b>	Transmission Control Protocol
<b>TSN</b>	Transmission Sequence Number
<b>UDP</b>	User Data Protocol

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background

In the OSI model, the transport layer protocol consists of three different protocols, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Stream Control Transmission Protocol (SCTP). The first two protocols (TCP and UDP) are the most employed protocols for data transfer, where they have served the internet well for many years, but do not ideally satisfy all application needs. Therefore, the birth of a new protocol; Stream Control Transmission Protocol (SCTP) came to significantly cover that lack left behind by TCP and UDP, where defined by the Internet Engineering Task Force (IETF) , to provide a reliable full-duplex connection and control network congestion mechanism as similar as TCP, and in contrast to UDP.

SCTP also offers new delivery options that are particularly desirable as in multimedia applications and telephony signaling. The SCTP connection called an ***association*** which provides novel services such as ***multihoming*** that allows the end points of a single association to have multiple IP addresses, and the ***multistreaming*** that allows for independent delivery among data streams(Lorenz & Dini, 2005).

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