

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

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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)
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By
Mohammed J. M. Elhalabi

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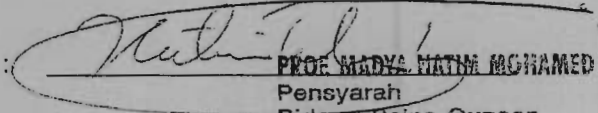
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
" يرفع الله الذين امنوا منكم و الذين اوتوا العلم درجات "صدق الله العظيم

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

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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

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

MTU

Maximum Transfer Unit

OSI

Open Systems Interconnection

QoS

Quality of Service

RTT

Round Trip Time

SACK

Selective Acknowledgement

SCTP

Stream Control Transport Protocol

SHUTDOWN

Shutdown

SHUTDOWN ACK

Shutdown Acknowledgement

SHUTDOWN COMPLETE

Shutdown Complete

TCP

Transmission Control Protocol

TSN

Transmission Sequence Number

UDP

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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