EVALUATION OF THE EFFECTIVENESS OF ACK FILTERING AND ACK CONGESTION CONTROL IN MITIGATING THE EFFECTS OF BANDWIDTH ASYMMETRY

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HAYDAR ABDULAMEER MARHOON

UNIVERSITI UTARA MALAYSIA

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EVALUATION OF THE EFFECTIVENESS OF ACK FILTERING AND ACK CONGESTION CONTROL IN MITIGATING THE EFFECTS OF BANDWIDTH ASYMMETRY

A project submitted to Dean of Awang Had Salleh Graduate School in Partial Fulfilment of the requirement for the degree
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BY

HAYDAR ABDULAMEER MARHOON

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Dean of Awang Had Salleh Graduate School

College of Arts and Sciences

University Utara Malaysia

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Abstract

The user demand for high speed and ubiquitous connectivity has led to the development and deployment of many new technologies, such as DSL and satellite-based networks, for accessing the Internet network. The goal of these technologies is to mitigate the bottleneck. Other technologies, such as wireless and packet radio networks aimed at providing the user with unrestricted access to their mobile devices and the Internet. Given that these networks are increasingly being deployed as high-speed access networks, it is highly desirable to achieve good network performance over such networks. These technologies show different characteristics (asymmetry) in uplink and downlink directions. Network asymmetry (uneven bandwidth) can negatively affect the performance of feedback-based transport protocol such as Transmission Control Protocol (TCP). This is because that congestion in any direction can affect the flow of feedback in the other direction. ACK Filtering and ACK Congestion Control techniques are used to diminish the congestion on the upstream link. These techniques suffer from sender burstiness and a slowdown in congestion window growth problems. This project addresses the TCP performance problems caused by network asymmetry and discuss the reasons for the inapplicability between TCP and asymmetric networks. It studies the effectiveness of these techniques in mitigating the effects of bandwidth asymmetry in TCP/IP networks and provides suggestions to overcome the problems associated with these techniques. Based on the performance model presented in this project, achieving optimum TCP performance under different asymmetric conditions is described.

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CHAPTER ONE

INTRODUCTION

This project is about examining effectiveness of ACK Filtering and ACK congestion control mechanisms in mitigating the effects of bandwidth asymmetry on the performance of TCP/IP network. The goal of this chapter is to place the project in its context. This chapter provides an introduction to network asymmetry and TCP performance over asymmetry networks in Sections 1.1. Asymmetry classification and the solutions proposed to improve the TCP performance in asymmetric environment are presented in Sections 1.2 and 1.3, respectively. The research problem is presented in Sections 1.4. Sections 1.5, 1.6, and 1.7 of this chapter, respectively, include the research questions, research scope, and objectives of the research presented in this project. The importance of the work done in this project is stated in Section 1.8 while the project organization is presented in Section 1.9 of this chapter.

1.1. INTRODUCTION

The increase in the user application that require high speed network with ubiquitous connection network has derived inventors to come up with many new technologies. According to Mahbub and Jain (Mahbub & Raj, 2003), some of these technologies, including cable modems, direct broadcast satellite with interactive return channels, Very Small Aperture satellite Terminals (VSAT), Asymmetric Digital

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