REDUCING REAL-TIME TRAFFIC PACKET LOSS IN MOBILE IPv6 USING TWO TIER BUFFER

SALIM M. ZAKI

A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Computer science)

Faculty of Computer Science and Information Systems
University Technology Malaysia

OCTOBER 2008

ABSTRACT

Mobile IPv6 is a network layer protocol for enabling mobility in IPv6 networks. MIPv6 was designed to allow nodes to be reachable and maintain ongoing connections while their location within the topology. A number of implementations of Mobile IPv6 have been done to enhance the functionality of MIPv6. This study proposes a new scheme to reduce real-time traffic packet loss in MIPv6 environment. The Network Simulator ns-2 and its extension MobiWan that supports IPv6 have been used to simulate this scheme and tested its efficiency. The scenarios in this study divided into two parts first five scenarios represent the standard Mobile IPv6 that does not support buffer, and second five scenarios with buffer. The difference between scenario and other in each part is the period of sending data from Correspondent Node to Mobile Node. However, the proposed scheme that uses buffer shows that it could reduce packet loss that occur during Mobile Node handover while the Correspondent Node sending data to Mobile Node. And this metric has been measured and compared with standard Mobile IPv6 in order to compare its efficiency. Some other metrics such as throughput and delay have been tested and compared.

ABSTRAK

Mobil IPv6 merupakan lapisan protokol rangkaian bagi membolehkan mobiliti di dalam rangkaian IPv6. MIPv6 telah direka bagi membenarkan nodus dicapai dan mengekalkan sambungan antara lokasi di dalam topologi. Beberapa perlaksanaan Mobil IPv6 telah dijalankan bagi menambah baik kefungsian MIPv6. Kajian ini mencadangkan cara baru yang akan membawa pengurangan dalam kehilangan paket masa nyata di dalam persekitaran MIPv6. Simulasi rangkaian ns-2 dan sambungannya, MobiWan yang menyokong IPv6 telah digunakan untuk mensimulasi cara ini dan menguji tahap ke cekapannya. Kajian kes telah dipecahkan kepada dua bahagian dimana 5 bahagian pertama kajian kes tidak menyokong buffer dan 5 bahagian yang berikutnya menyokong buffer. Perbezaan yang terdapat di dalam kajian kes adalah tempoh sela masa penghantaran data dari nodus penghantar kepada mobil. Metrik ini telah diuji dan di bandingkan dengan Mobil IPv6 piawai bagi memperolehi hasil perbezaan kecekapan. Kaedah metrik yang berlainan juga seperti “throughput’ dan “delay’ telah dibandingkan bagi menguji kecekapannya.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The Internet today is not a simple hierarchical structure. It is made up of many wide and local area networks joined by connecting devices and switching stations. It is difficult to give an accurate representation of the Internet because it is continuously changing (i.e. new networks are being added, existing networks need more address, and networks of defunct companies need to be removed [1]). Today most end users need to use the Internet for different purposes such as IP telephony, video conference, email, and other online operations.

The wireless mobile Internet, which was a dream just a few years ago, is now progressing so fast and revolutionize the whole framework of the telecommunications industry. The wireless mobile Internet is an extension of the Internet into the mobile environment, which gives users access to the Internet services while they are on the move [2].

Most networks on the Internet currently use Internet Protocol version 4. However, this version has significant shortcomings. The primary problem is that the Internet address is only 32 bits in length with the address space divided into different classes. With rapid growth of the Internet, this addressing scheme cannot handle the projected number of users [1]. IETF has designed a new version called version 6. IPv6 also known as IPng (IP next generation), uses 128-bits (16-byte) address, versus the 32-bit (4-byte) address currently used in version 4 [8]. IPv6 can accommodate a larger number of users. In version 6, the packet format has been simplified, yet at same time it is more flexible to allow for future addition of features.

The new version supports authentication, data integrity, and confidentiality at the network later. It is designed to handle the transmission of real-time data such as audio and video, and can carry data from other protocols. IPng can also handle congestion and route discovery better than the current version [1].

Mobile communication has received a lot of attention in the last decades. The interest in mobile communication on the Internet means that IP protocol, originally designed for stationary devices, must be enhanced to allow the use of mobile computers [1]. Mobility has been supported in both Internet protocol versions. Mobile IPv4 allows transparent routing of IP datagrams to mobile nodes in the Internet, and Internet protocol version 6 allows nodes to remain reachable while moving around in the network.

1.2 Problem background

The increase of mobile computing devices and wireless networking products over the past decades has necessitated the support for host mobility

on the Internet. In Internet environments, when a host moves and attaches itself to another network, it needs to obtain a new IP address. With this change of IP address, all existing connections to the mobile host terminates, as the IP routing mechanisms cannot deliver the data to the correct end-point. Mobile IPv4 [3] overcomes this by introducing a level of indirection at the network (IP) layer. It deploys a home agent that intercepts packets from the correspondent host and redirects these packets by tunneling them to the mobile node via a foreign agent in the visiting network. This approach ensures correspondent host transparency and only requires the mobile node to update its location to the home agent when changing between networks. However, initializing this indirection requires a timely home network registration process and an address resolution procedure. However, some shortcomings accompany MIPv4 such as triangle routing [4].

Mobile IPv6 has some features that could overcome MIPv4 shortcomings and provide better support for real-time traffic between the correspondent node and the mobile node [4]. Handoff for a mobile node causes packet loss. This problem will be huge during real-time sessions between the mobile node (MN) and the correspondent node (CN). Several solutions have been proposed to overcome this problem in MIPv6 such as fast handover and hierarchical MIPv6, including their extensions, which each of them aims to reduce packet loss as much as possible.

1.3 Problem statement

When the mobile node moves from one subnet to another, it cannot receive packets that the correspondent node sent to it. This unreachable problem remains until the mobile node gets new address and sends its

binding updates to inform the correspondent node about its new address. In real-time traffic this situation will be a huge setback.

A new scheme will be proposed to reduce real-time traffic packet loss in MIPv6 handoff procedure. This scheme will be evaluated through simulation experiments to investigate its efficiency compared to other existing techniques.

1.4 Project objectives

The objectives of this study are as follow:

1. To investigate existing schemes that deal with reducing packet loss in MIPv6.
2. To propose an alternative scheme that could reduce real-time packet loss in MIPv6.
3. To evaluate the efficiency of the proposed scheme compared to the existing one.

1.5 Project scope

1. This study will focus only on the implementation of the proposed scheme in MIPv6 environment.
2. The performance evaluation of the proposed scheme will be made through a series of simulations using NS-2 network simulator and its extension mobiwan to support IPv6.

1.6 Importance of the study

Proposing the new scheme, communication in MIPv6 will be made more reliable by reducing the number of packet loss.

1.7 Organization of the report

This chapter provides an introduction and some basic information about the Internet protocol. Apart from that, problem background, problem statement of packet loss in MIPv6, project objectives, and project scope are also discussed in this chapter.

Chapter 2 discusses the relevant background of Mobile IP and gives the concept of TCP/IP and Mobile IPv6. This chapter discusses the handoff procedure and the enhancements of MIPv6 and some existing works.

Chapter 3 introduces the methodology of this study, the framework and the stages of the project included in this chapter.

Chapter 4 shows the implementation of the proposed scheme.

Chapter 5 discusses the network model and the simulation model with its parameters for the proposed technique, and the results with its analysis are discussed at the end of this chapter.

Chapter 6 concludes this study with the summary of the work that has been done and gives a future work.

1.8 Conclusion

Mobile Computing is becoming increasingly important due to the increase in the number of portable computers and the need to have continuous network connectivity to the Internet irrespective of the physical location of the node. The next version of IP, IPv6 is designed to be an evolutionary step from IPv4. Mobility support in IPv6 solves many of the problems of basic Mobile IP. However, there is still a problem in handoff procedure in MIPv6 such as packet loss. This research proposes a new scheme that tries to reduce packet loss in real-time traffic between the mobile node and the correspondent node in MIPv6.

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