CHAPTER I

THE PROBLEM

1.1 Rationale

Nowadays, wireless technology consumption is widely used and people keen on 3G and 3.5G Technology especially Highspeed Downlink Packet Access (HSDPA). However, the previous technology such as General Packet Radio Service(GPRS) is never absolutely abandoned since GPRS has been implemented most of coverage areas. The network interface devices also become very cheap. Those high availabilities of network interface devices enable mobile devices to use multiple wireless connections concurrently[10].

A host or a device which has multiple Transmission Control Protocol(TCP) connections is called multipath-host. Multipath is a technique to increase the reliability of the internet connection for an IP network. The implementation of this technique can be depicted as a host with two connection paths working simultaneously, when one of them fails the other will back up the connection[8]. This technique can be used on a mobile device with more than one air interface from one account from the Internet Service Provider. Since most of the modifications lied on the host, the fairness problem appears. For example, on a bottleneck condition where a multipath host has 3 connections and there are another 3 normal hosts which each of them has one connection. The multipath host will dominate 3/6 bandwidth of the bottleneck since the network treats each connection as single connection. Since the multipath host has only one account, in term of fairness, the multipath host should only have ¼ bottleneck bandwidth since there are only 4 hosts exist.

This study designs the solution of that problem. Since most of the customers use mobile devices using wireless, this study discusses this problem on a HSDPA upstream case using TCP Westwood+ that is usually suitable for wireless condition[15]. The objective of the research is to design the modification on transport layer to achieve fairness on a bottleneck link for a multipath host. Since TCP congestion control has main role for a packet delivery algorithm, the TCP congestion control is modified. Previous works such Bi-dimensional-

Probe Multipath Congestion Control(BMC)[8] which modifies congestion control for wired network and designed for TCP Reno is the consideration for the research.

1.2 Theoretical Framework

As described above, Multipath TCP is TCP with multiple connection paths but working like a single TCP. Normal TCP only uses a single path to send data from source to destination, but Multipath TCP splits the data and sends them using different paths.

1.3 Conceptual Framework

From the theories, normal network treats each connection of Multipath TCP as a single connection which causes Multipath TCP consumes more bandwidth on a bottleneck and violates fairness. The main measured metric is throughput, since throughput represents the bandwidth consumptions.

1.4 Problem Identification

The main problems discussed in this research are:

a. What is the design of the Congestion Control on wireless multipath connections that maintains the fairness on shared bottleneck link?
b. What is the quality of the Congestion Control to adapt the condition of wireless lossy network?

1.5 Hypothesis

Premises :

- Bi-dimensional-Probe Multipath Congestion Control(BMC) giving each connection static weight depends on each connection's maximum bandwidth so that each connection's throughput can be controlled to maintain the fairness of total throughput[9].
- The current BMC is designed for wired using TCP Reno[8].

Hypothesis :

- The best TCP variant for wireless is TCP Westwood+ which adapts the congestion window according to the bandwidth if packet-loss occurred. If the weighting method is designed for TCP Westwood+ on each wireless multipath connection, the utilization is higher without damaging the network fairness.

1.6 Assumption

The assumptions used in this study are:

a. The experiments assume all the air interface type are homogenous.
b. The bytestreams segmentation and reassembling mechanism is not discussed in detail.

1.7 Scope and Delimitations

The scopes of this research are:

a. The research covers system design and experiments are tested using Network Simulator 2.
b. The channel model is wireless High Speed Downlink Packet Access(HSDPA) which is characterized by long distance from the base station and fluctuating bandwidth.
c. The research only discusses the congestion control algorithm of the protocol and does not discuss the protocol structure.

1.8 Importance of the Study

The study has four objectives, namely:

a. Designing the weighing algorithm for Congestion Control for TCP Westwood variant to keep the fairness of shared bottleneck network.
b. Evaluating the adaptability of the congestion control on wireless network.
c. Increasing the performance of the host which has multiple wireless interfaces without interfering another host spare bandwidth.
d. Increasing the utilization of the networks because all interfaces are used simultaneously.