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DYNAMIC BANDWIDTH NEGOTIATION SYSTEM FOR LAN/WAN

THESIS PRESENTED BY

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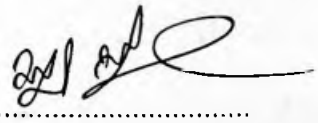
The work presented in this dissertation has not been submitted for the fulfilment of any other degree



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TO MY PARENTS...

Abstract

The Internet is a critical infrastructure today, in both developed and developing countries. Most of developed countries have reached large percentage of their population with high bandwidth internet connections. They have gigabit links at organisations and megabit connections even at homes. Now, the focus is terabit speed connections. Much current researches in developed countries focus this era of the technology.

This thesis is concentrated on the Internet connections used at educational institutes. The Internet is heavily used by students, researches and the academic staff for academic purposes. Further, most of the sites they access are distributed around the world. The amount of local content is very little in developing countries. Therefore, unlike developed countries that have lot of internal traffic, developing countries have the problem of scarcity of international bandwidth.

The cost of International bandwidth is unbearable for the economies in developing countries. There is less than 10 Mbps bandwidth available of the entire University system in Sri Lanka. Many of the organisations are relied on dialup links or ADSL connections which are about 56~128 kbps. Only a few organisations have dedicated 128kbps ~ 2Mbps links.

Many of organisations have multiple Internet links (e.g., departments in the same University) to the same local network. These departments are willing to share their spare bandwidth with others, provided that they will receive other's excess bandwidth in their needy time, if available. Bandwidth as a whole can be better utilized by such sharing.

Our research addressed the above issues and came up with a system for dynamic bandwidth sharing among co-operative organisations. The system is developed as a plug-in for the open source Web proxy software, *Squid*. It consists of:

1. Bandwidth Monitoring System
2. Inter-Proxy Bandwidth Negotiation Protocol
3. Module for Bandwidth Granting on demand
4. Module for Optimal User Redirection via multiple uplinks

The Bandwidth Monitoring System in each proxy server continuously monitors the local bandwidth link usage. If the local link is under-utilized it announces the available excess bandwidth to its neighbours. If the monitoring system detects that the local proxy is running out of bandwidth it checks neighbours announces to retrieve excess bandwidth from them. Inter-Proxy Bandwidth Negotiation Protocol is used to negotiate bandwidth among proxy servers. When the system decides particular bandwidth donor it uses the Bandwidth Granting Module to permit the bandwidth requester through the donor's link. User Redirection Module optimizes the local user redirection via multiple uplinks at the bandwidth requester's end for better utilization of both links.

Currently a prototype of the system is deployed for the two Internet links available at the University of Moratuwa. It proves that the collective bandwidth sharing improves the bandwidth utilization as a whole among co-operative organisations.

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I dedicate this thesis to my parents who have dedicated their entire life for my education.

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