ON-THE-FLY INTER-PROXY DATA COMPRESSION FOR WEB ACCESS

THESIS PRESENTED BY

P.S.K. GURUSINGHE

SUPERVISED BY

P.G.V. DIAS

This thesis was submitted to the Department of Computer Science and Engineering of the University of Moratuwa – Sri Lanka

In partial fulfillment of the requirements for the

Degree of Master of Science

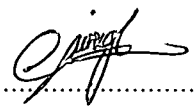
Department of Computer Science and Engineering

University of Moratuwa

Sri Lanka

December 2005

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



.....

P.S.K. Gurusinghe

(Candidate)

.....

P.G.V. Dias

(Supervisor)

Dedicated to My Parents...

Abstract

Obtaining a reasonable speed for web access is a problem in many areas, especially for small organizations such as schools, dial-up, and mobile users, due to the low bandwidth of the available links. One solution, which is supported by HTTP 1.1, is the compression of web pages, but this needs support by both the web server and web client. As most web servers have not enabled such support, this feature is in limited use.

An alternative option is to implement compression between two proxy servers located at each end of the bandwidth-limited link. This dissertation describes the implementation of such a system.

A compression scheme was implemented which is transparent to both client and server. Data is compressed at the upstream proxy server of the bandwidth-limited link, and de-compressed at the downstream proxy server of the link. Different types of content are identified based on the content-type HTTP header and different compressors are used on each content-type.

HTTP headers and text content-types (html, css, txt etc.) are highly compressible. A number of text compression schemes were evaluated, and, gzip was selected as the compressor for such content. A unique feature of our system is the use of a pre-set dictionary for HTTP header compression, which enabled us to get very good compression ratios.

Although jpeg images are already in a compressed format, they can generally be further compressed without excessively degrading the perceived image quality. We do so whenever feasible.

Persistent connections over the limited bandwidth links were introduced to eliminate the delay caused by TCP connection establishment.

The performance of the system under different workloads was analyzed, which showed that the system provides a significant improvement in response time over a low-speed connection.

Acknowledgement

I am taking this opportunity to thank Prof. (Mrs.) Rathnayake, the Director of Postgraduate studies for selecting and nominating me for the Asian Development Bank scholarship. And also, I wish to acknowledge the financial support received by Asian Development Bank's personnel development fund of Ministry of Science & Technology, Sri Lanka.

I am grateful to the following: project supervisor, Dr. Gihan. V. Dias for his direction and supervision of the project and particularly for his instruction and frequent scrutiny of results, recommendation on methods, analysis and presentation of results. Without such guidance, I would not have been able to implement such a complex system easily; project co-supervisor, Ms.Vishaka Nanayakakara for her assistance, friendliness and guidance throughout the research; Dr. Mark Adler and Dr. Jean Loup-Gailly who are the owners of the gzip for their help. Dr. Sanath Jayasena and Mr. Shantha Fernando for their untiring urge to offer assistance and guidance where needed. My special thanks go to Dr. Ajith Pasqual, for his comments, corrections and guidance given at each progress review, which improved my works.

I am grateful to staff members and my colleges for their frank comments and helping me with my daily work.

Finally my deep gratitude for my spouse and parents for their encouragements and helps right through out this period.

Table of Contents

Table of Figures