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T. M. Nguyen, D. Tjondronegoro (eds.)

Frontiers In Mobile and Web Computing: Proceedings of MoMM2006 & iiWAS2006 Workshops

December 4-6, 2006
Yogyakarta, Indonesia

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PREFACE

Welcome to Yogyakarta City and to iiWAS/MoMM-2006 Workshops. The Workshops are held in conjunction with iiWAS2006 and MoMM2006 International Conferences on 4-6 December 2006, in Yogyakarta, Indonesia.

It is for the first time for iiWAS and MoMM to hold workshops. We had this year 5 workshops: SIIK-2006 (Semantic Information Integration on Knowledge Discovery), MoMIR-2006 (Mobile Multimedia Information Retrieval), BWCCA-2006 (Broadband and Wireless Computing, Communication and Applications), SoC-2006 (Systems-On-Chips), TwUC-2006 (Trustworthy Ubiquitous Computing), one symposium ERPAS-2006 (Emerging Research and Projects Applications Symposium) and MDC-2006 (Masters and Doctoral Colloquium) .

The purpose of these workshops is to bring together developers and researchers to share ideas and research work in the emerging areas of Web-based application, Web services, information networking, mobile and ubiquitous computing, semantic information integration, information retrieval, and embedded systems. The papers included in the proceedings cover all aspects of theory, design and applications. Interest in the workshops has been confirmed by the submission of many papers from all over the world. The submitted papers were peer-reviewed from Program Committee (PC) members of each workshop and based on the review results 72 papers were accepted for presentation (BWCCA-2006: 9 papers; MoMIR-2006: 7 papers; SIIK-2006: 14 papers; SoC-2006: 8 papers; TwUC-2006: 7 papers; ERPAS: 19 papers; and MDC: 8 papers).

International Workshops of this size require the support and help of many people. A lot of people have helped and worked hard to produce a successful iiWAS/MoMM-2006 Workshops Proceedings. First, I would like to thank all the authors for submitting their papers, the workshops organizers especially Dr. Nguyen Manh Tho, Vienna University of Technology, Austria, Dr. Dian Tjondronegoro, Queensland University of Technology, Brisbane, Australia, Dr. Arjan Durresi, Louisiana State University, USA, Dr. Ben A. Abderazek, National University of Electro-communications, Japan, Mr. Thomas Grill, Johannes Kepler University Linz, Austria.

I would like to thank Dr. Ismail Khalil Ibrahim, the president of @WAS organization and the Steering Committee Chair of iiWAS/MoMM International Conferences for his continuous support and encouragement to organize the workshops. I am also grateful to iiWAS/MoMM-2006 PC Chairs Dr. David Taniar and Mr. Eric Pardede for their support and help. I would like to thank the Local Arrangement and the Administration Staff of Atma Jaya University, Yogyakarta for their support and local arrangement of the workshops.

I would like to give special thanks to the International Organization for Information Integration and Web-based Applications and Services (@WAS), Austrian Computer Society, Johannes Kepler University Linz Austria, IEEE Indonesian Section, IEEE Communication Society, Indonesian Chapter, Monash University Australia, and La Trobe University Australia.

Leonard Barolli, Fukuoka Institute of Technology (FIT), Japan
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Table of Contents

Proceedings of MoMM2006 & iiWAS2006 Workshops

BWCCA 2006

Session A – Network Models, Algorithms and Analysis

Session B – Multimedia Applications and Network Protocols

MOMIR 2006

Session A – Mobile Multimedia Applications

SIIK 2006

ERPAS

Author Index

A LOOSELY COUPLED ARCHITECTURE OF WEB SERVER USING SOCKET CLONING

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Abstract

With the ever-growing web traffic, cluster-based web server is becoming more and more important to the Internet's infrastructure. Making the best use of all the available resources in the Internet to achieve high performance is thus a significant research issue. This paper will address a web server serving requests for documents having multimedia (image, video, animation) hyperlinks. We proposed a model that can reduced load on the main web server by distributing load of transferring multimedia content to other server. Some related issues with this model will be discussed.

1. HTTP

Web applications highly relied on HTTP protocol to mediate communication between client, such internet browser, and web server. According to [1], Hypertext Transfer Protocol (HTTP) is a method used to transfer or convey information on the World Wide Web. Its original purpose was to provide a way to publish and retrieve HTML pages. HTTP is a request/response protocol between clients and servers. The originating client, such as a web browser, spider, or other end-user tool, is referred to as the user agent. The destination server, which stores or creates resources such as HTML files and images, is called the origin server. In between the user agent and origin server may be several intermediaries, such as proxies, gateways, and tunnels.

HTTP pipelining appeared in HTTP/1.1. It allows clients to send multiple requests at once, without waiting for an answer. Servers can also send multiple answers without closing their socket as shown in figure 1. This results in fewer roundtrips and faster load times. This is particularly useful for satellite Internet connections and other connections with high latency as separate requests need not be made for each file. Since it is possible to fit several HTTP requests in the same TCP packet, HTTP pipelining allows fewer TCP packets to be sent over the network, reducing network load. HTTP pipelining requires both the client and the server to support it. Servers are required to support it in order to be HTTP/1.1 compliant, although they are not required to pipeline responses, just to accept pipelined requests.

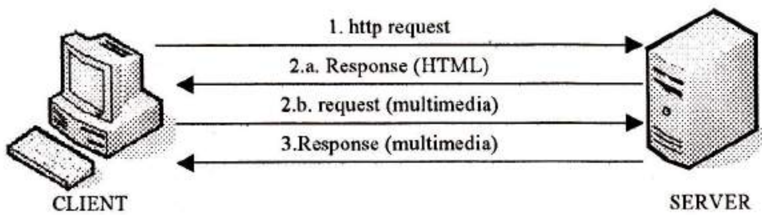

Figure 1. HTTP 1.1 specification for requesting a document with multimedia links

2. Socket Cloning

In a client-server application model such as web applications, the performance of the system relied heavily on the performance of the server and the beneath networking infrastructure [2]. In a high load web application, the web server must serve many concurrent client requests, thus the response time to clients may decrease significantly.

To handle the performance problems of the server, one of the solutions is migrating some of the processing to other machine. Moving a process to other computer machine for load balancing process can be found also in the area of parallel computing and network applications.

One of the problems in migration of a process that serve requests from clients is to clone or migrate their communications end point or sockets. An example of cloning socket system is presented by [3] and [4]. The architecture of their system proposal is shown in figure 2. There are three components are added to proprietary web server system that are, Server Cloning Client (SC Client), SC Server, and Packet Router. Socket Cloning (SC) Client provides a system call interface to the web server in the node. Web server invokes this system call if it decides to migrate a request processing. All relevant information, client application request and its opened socket will be sent out to remote SC server that connects to current node via persistent connection. The whole message is called *SC Message*. The current web server node can continue to server other request. When the remote SC Server receives an SC Message, it creates a socket clone based on received SC Message, processes contained request and sends the results back to client via the cloned socket.

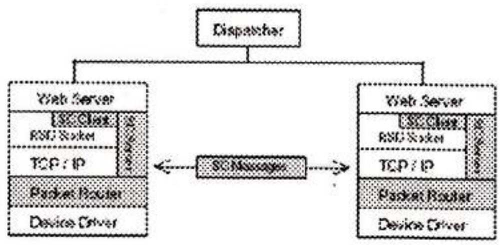

Figure 2. Architecture of Socket Cloning System

Note, upon successful cloning the socket, the SC Server will send an acknowledgement back to the SC Client that sending SC message. It will then inform the Packet Router to route subsequent packets for that socket to the clone's node. Figure 3 shows how a series of HTTP requests are handled in this system. Thus the packet from client application will travel to original Web server node, then redirect by its packet router to remote SC Server, and after processing the results are sent back to client directly. After cloning, the original socket remains in its node. It will not be destroyed until the connection is closed. In persistent HTTP, the original socket will handle further messages received in the connection after cloning. The clone will be closed after serving a request.

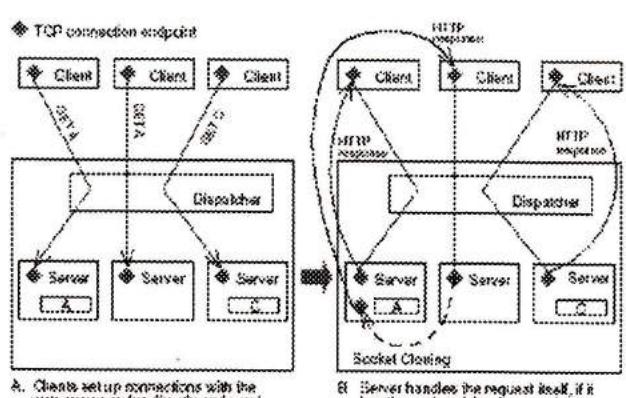

Figure 3. SC in Cluster-Based Web Server

3. HTTP Response with Socket Cloning

High volume accessed services such as Yahoo!, Google highly relied on the high performance of their server and network infrastructure to provide high quality of service (QoS) . Network-transfer speed is mainly a matter of your Internet-link bandwidth, while server-response time depends upon resources such as server specifications, architecture of applications and their coding. Improving server performance can be done by providing redundant servers in a cluster offering the same service. Cluster system is a tightly coupled system, where each server in a cluster has a contract to providing the same services.

In this paper, we proposed a more loosely coupled model to alleviate the load on the web server. Our proposed scenario is shown in figure 4. Client applications request a document by a http request. The reply usually consists of html data plus multimedia contents linked in the requested document. Transferring multimedia content puts much more load on the server compared to html data. Thus to alleviate load on the web server, the task of transferring multimedia content to clients can be assigned to other servers (Cloning Server), which are not necessarily a web server.

The web server is responsible to handle the creation of all socket needed to transmit all content of a client request. When identifying that a socket is used to transmit a multimedia content, then the web server will resort to clone the socket to the lightest load cloning server. Note, a mechanism to monitor the load of each cloning server is needed to do such a selection. For the socket cloning, the technique presented in [3] and [4] can be adopted.

The other important issue is the articulation of the multimedia resource location address between web server and cloning server. There are at least two approaches that can be used. First, both web server and cloning server are configured to have a similar directory service; in most case will be a kind of the web server directory service. This mean each cloning server needs to install directory service similar to web servers. The other approach is, the web server translates the address of multimedia resource to that can be understood by the cloning server's local file system or directory service installed in it.

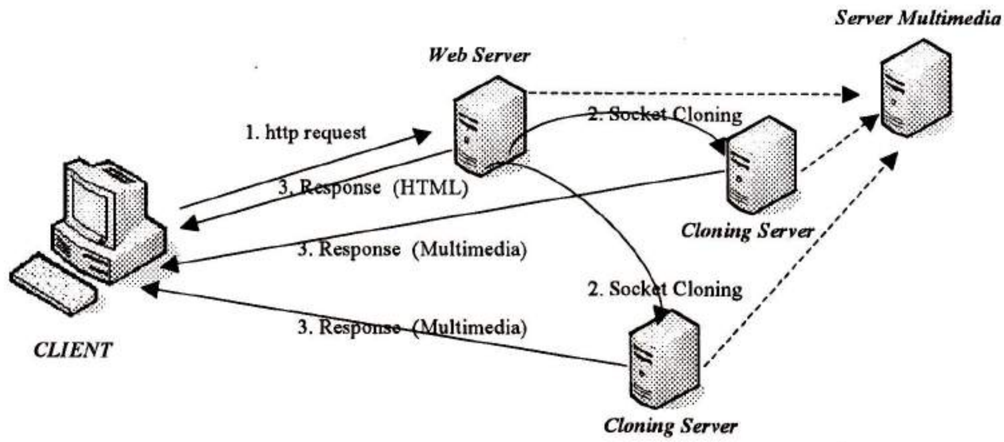

Figure 4. Load balancing by migrating transmission of multimedia content

4. Conclusion

In this paper, we have propose a model to alleviate load of web server by assigning to other machines the tasks of transferring multimedia content to client. Some related issues such socket cloning and directory service used between web server and cloning server also discussed. Further work can focus on implementation and testing of the model

5. References

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