

Enhanced Load Balancing In Distributed Web Server Systems Using Document Replication Mechanism

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Abstract. *The explosion of data traffic on the World Wide Web (WWW), web servers are often experiencing overload from an increasing number of users accessing the servers at the same time. To address the performance and scalability problems of web servers, Distributed Web Systems are used to share the load in the web servers. The nodes in the Distributed Web System distribute the documents themselves. In this case the response load shared but the document distribution process load added to the distributed web system. In a Distributed Web Server location of document and replication process are very important for load balancing. The traffic generated due to movements of documents at runtime during load balance could also affect the performance of the DWS system. This research work shows that minimizing such traffic in a DWS system. Several heuristic document distribution schemes like distribution based on the request ratio and request count to perform partial replication of site's documents at selected server locations so that load balancing is maintained. This system adds a new alternate web server to handle the failure problem of the centralized web server.*

Keywords: *Distributed web server – Document replication – Load balancing – Mirror server – Partial server - Alternate web server – Main server*

1. INTRODUCTION

The World Wide Web is a vast network of documents that are linked together a set of protocols defining how the system work and transfer data. With increased popularity of web there are a number of problems: 1.Servers overloaded 2.Internet Backbone congestion 3.Slow web services access. Approaches to reduce server load i) Mirror Web Site: Replicate web server contents throughout network ii) Web Caching: Stores frequently requested web documents closer to the users iii) Distributed Web Server: Web documents are distributed among a cluster of Server acting as a single server.

1.1. Problem Overview

In this system all the servers are connected to form a distributed web server system. All the web servers have same list of documents except the partial web server[2]. The Partial web server contains only a selected list documents based on the request load in the web server. There are three major tasks are handled by the web servers[3]. They are handling request response operations, load balancing tasks and document distribution process. In the request

response handling process the web server receives the request from the client and sends the response to the client. The load balancing is carried out either by main web server or by the alternate web server.

In the load balancing process all the client request are received by the main web server then the server analysis load for the various servers and assign the server to sent response to the client[4]. The document distribution process manages the various activities of the document distribution between the web servers. Mainly document distribution process is carried out between the main server and partial web server.

2. MAIN WEB SERVER

The main web server is the centralized system in the DWS environment [1]. The entire client request is directly received by the main web server[5]. The main web server maintains the client request and the various transactions in the DWS system. All the load balancing and document distribution tasks are controlled by the main web server. The main web server (Fig. 1) is directly connected with entire web server that is located in the DWS system.

3. ALTERNATE WEB SERVER

This server is the alternative to the main web server. The alternate web server monitors the various activities of the main web server and it takes the necessary steps then the failure of the main server is occurred[6]. If the main web server is down due to some internal problems then the alternate server has the authority to control all web servers in the DWS system.

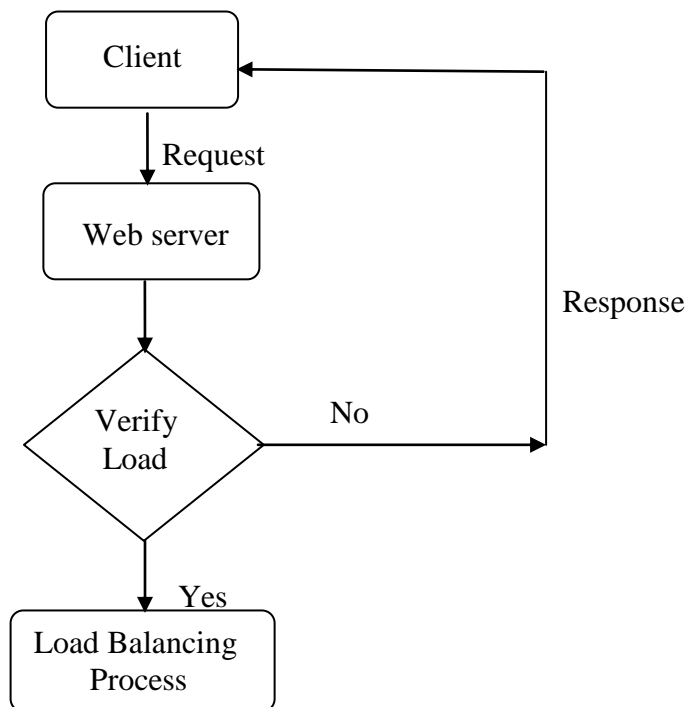


Fig. 1. Main Web Server process

4. MIRROR SERVER

The Mirror server (Fig. 2) is also a web server that contains all the documents of a main web server. This server is designed to share the load of the main web server. The main server load is redirected to the mirror server based on the load balancing schema[7]. These servers also send response to the client. The mirror server load is monitored by main web server.

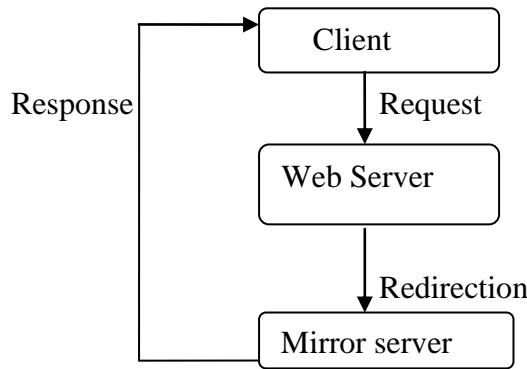


Fig. 2. Mirror Server

5. PARTIAL SERVER

It is the light weighted web server (Fig. 3.) in this system environment. This server contains only a Partial content of the main web server[8]. The document movement process is done in the basis of the main server load. Mostly the partial web server contains frequently requested documents from the clients. The load of the partial web server is also monitored by the main web server.

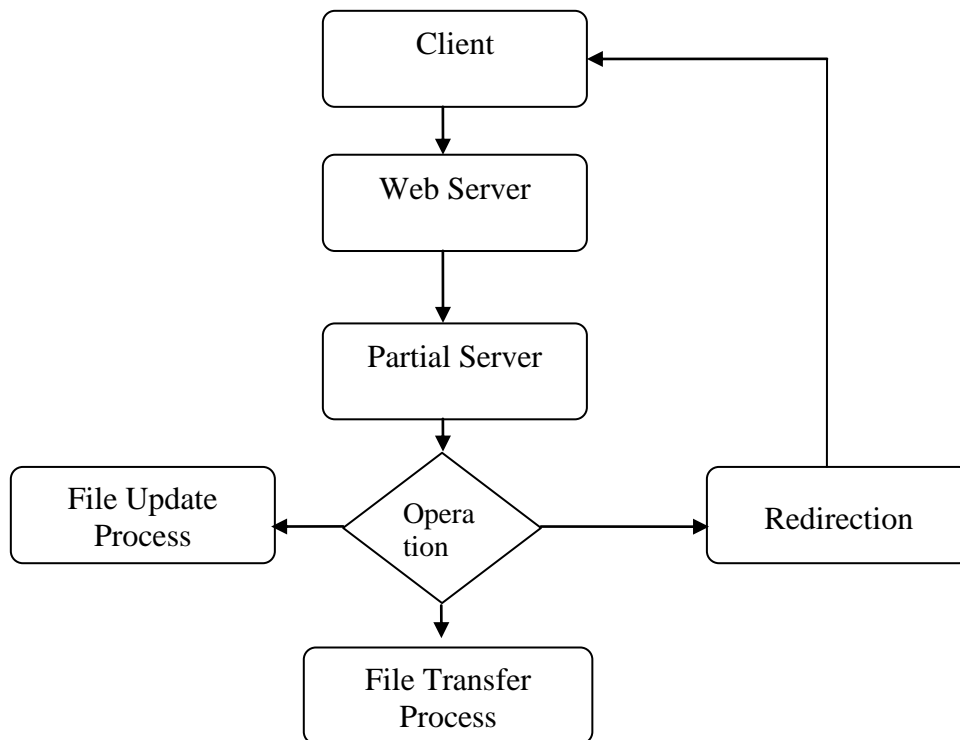


Fig. 3. Partial Server

6. REQUEST LOG MANAGEMENT

The request log management process is performed in the main web server. All the client request is received by the main web server[9]. The main web server stores the request details into the request log tables. The request details contain the information line requested time. The request count is added into the request count field for each request document. The request log table data are analyzed in a default threshold interval time[10]. Based on the request count selected documents are distributed into the partial web server.

The request log table data are updated for each and every request received from the client[11]. The request log table contents are cleared after the completion of the analysis process. The request log table contents are analyzed in two situations. They are the frequent interval analysis and the analysis based on the request count.

6.1. Document Distributed process

Then document distribution process is done between the main web Server and partial web server[12]. A set of selected documents are copied in to the partial web server from the main web server. This process is very useful to reduce the internal distribution load inside the DWS. The document distribution process is carried out in a frequent time interval. The document distribution process has two major tasks. They are the request log management and the file transfer and management process.

The main web server has the document collection for the entire site. The mirror server and the alternate server also have the some content of the main web server. The main web server loads are transferred to the mirror web server. One or more mirror server contents are updated in same time. But the partial server contents are server are updated by the main server based on the load requirements.

The document distribution process is mainly used to reduce the load of the web server. Partial document distribution system is used to reduce the document distribution load in the DWS system. The document distribution system has two major tasks. They are the file transfer process and the file list management process.

The file transfer process maintains the file transfer operations between the main web server and the partial web server. A separate command sequence is used to initiate the file transfer process. The main web server sends the documents to the partial web server. Then the partial web server receives the file and stores the document in its storage area. Partial server contents should also update whenever the main web server document contents are modified. During the updating process some the documents in the partial server can be removed based on the main server's instruction.

The distributed file list management process s done in the main web server and partial web server. The current contents of the partial server are maintained in the distributed document list log table. The request redirection process between the main web server and the partial web server is carried with the support of the distributed document list log table. Some times the main web server removes the selected documents from the partial server. At this situation the distributed documents list log also updated with the current contents of the partial web server.

6.2. Distribution Load

The web server manages the document distribution load. It is an internal load in the DWS system. Partial document replication is the main concept used to reduce the document distribution load. The documents distribution is controlled by the main web server. The

document distribution process is done only for the frequently requested documents. The document Distribution process is carried out in a frequent interval. The distribution load is occurred only at the time of document transfer process. The system distributes the documents that are having the high popularity. At the maximum the partial web server may store the 25% documents of the main web server. By this way the load and storage requirements are reduced. The main server also removes the less popularity documents in the partial web server. This process reduces the storage requirements of the partial web server.

6.3. Load Balancing Process

In this research two types of load are considered. They are request load and document distribution load. The request load is generated by the clients and the document distribution load is raised at the time of document distribution process inside the DWS. This two type of loads are balanced by this system. The request load is handled by the request redirection process of the main web server. The partials document distribution system reduces the document distribution load inside the DWS system.

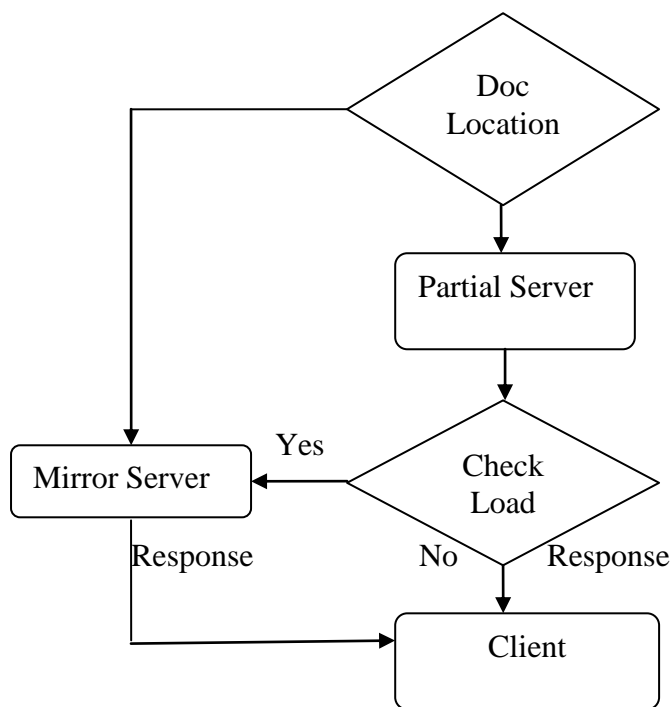


Fig. 4. Load Balancing Process

The main web server is the centralized system in the DWS environment. All the client request are received by the main web server only. The main server always updates the load information for the various servers in the system. Initially the main server check its load if the server has low load levels then the main server automatically send the response to the client. If the server load is exceeds the limit then the server check the load for the mirror server and partial server. After selecting the corresponding web server the main server redirects the request to that server. The mirror server and partial server automatically send response to the requested client.

The main server checks the load in two different categories. They are load based on the request count and load based on the estimated response time. All the web server responses are handled by the separate threads. Response for the each client request should be

assigned a separate thread. The web server has a limitation for the number of that can be run in the system. The maximum thread count can identified by a threshold value assigned by the server administrator. The response time is estimated by the size of the document and average data transfer rate for the system. Load is analyzed in the above two methods.

If the server has been found as overloaded then the selection of the other server process is started. Then the main server checks the list of the partial server documents and partial servers load also. In the partial server contains the requested document and low load level then the request redirected to the partial server otherwise the request is redirected to the mirror server. The main server sends busy notification the client when all the servers are identified as overloaded.

7. IMPLEMENTATION

The implementation of the system has four sever applications and a client application. Web server, alternate web server, mirror server and partial server are the four server application developed in this system. There is a web client application also developed in this system. The web server is the main server for all the servers. All the client request are handled by the web server.

The alternate web server is developed to handle the client's request in the case of any problem in the main web server. Mirror server is developed to share the load of the main web server. The partial web server is also developed to perform the work of web browser task. The system is implementing in VB.net language under the windows platform. The overall architecture of the system is described in fig. 5.

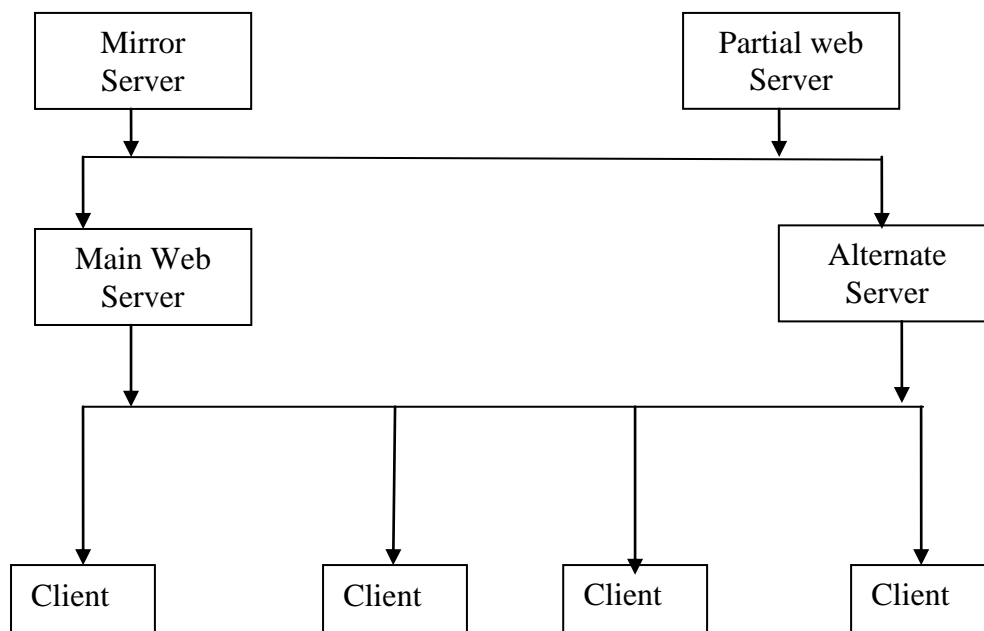


Fig. 5. System Architecture

8. CONCLUSION

This research work is mainly aimed to reduce the document distribution load and the clients request load in the web server under the DWS environment. This research work also aimed to

in a solution to handle the web server failure problems. This research work analyzes the rules used in a document distributed in a DWS system.

This research work introduces an alternate web server concept to handle the failure of the web server. Based on the contents it is similar to the mirror server. In addition the alternate server monitors all the activities of the main web server and takes the necessary steps to handle the web server failure problems. The web server and the alternate web server are grouped into a multicast socket. So both the servers can get the clients request.

The partial document distribution schema is proposed in this research work a separate load balancing schema is applied in this system. This schema is applied in this system. This schema evaluates the load with the consideration of the request count and the estimate response time. All the proposed concepts are implemented and their performances are analyzed. It showed that the heuristics can balance the load among the server nodes during run-time of the DWS system, and traffic due to movement of the document is negligible.

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