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Comparative Performance Analysis of Single Web Server and Load Balancing Web Server as a Web Server Workload Solution

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Abstract

Load Balancing Web Server is one of the means used to improve the performance and availability of Web Servers, is to divide the requests are coming to multiple servers at once, so that the load borne by each lighter. So due to get a lighter workload then directly affect the performance of Web servers are increasingly responsive, level of availability web server can also be maintained. By using load balancing technology, then there will be a difference in the performance of Web Server Load Balancing with Single Web Server, which can be used as a comparison, so it can be a solution for managing Web Server.

Keywords : *Web Servers, Load Balancing, Single, Performance*

1 INTRODUCTION

Developments in information technology today is growing very rapidly, this development can be seen from the website uses an information provider. Web server is the main component in the development of a website, so it requires a web server has the reliability, availability and scalability very well. An information service provider in this case is a website that is accessible to millions of users, each information request to the web server will become a burden, and more requests are accepted, also increasing the burden of a web server, a web server is overloaded if it will cause webserver to be down. This is of course directly into a disadvantage as information providers and users of information. Load balancing is one of the solutions to overcome this, because load balancing can improve reliability, the availability and scalability. In this study analyzed how the performance difference between a single Web Server with Load Balancing Web Server technology so as to provide clarity difference why Load Balancing can be a solution for a Web server that has a high workload.

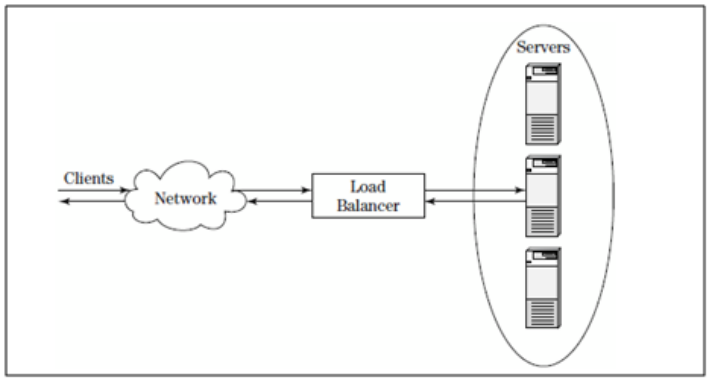

Figure 1: Main page of news aggregator

1.1 Load Balancing Definition

With the advent of the Internet, the network now occupies center stage. As the Internet connects the world and the intranet becomes the operational backbone for businesses, the IT infrastructure can be thought of as two types of equipment: computers that function as a client and/or a server, and switches/routers that connect the computers. Conceptually, load balancers are the bridge between the servers and the network, as shown in Figure 1.

On one hand, load balancers understand many higher-layer protocols, so they can communicate with servers intelligently. On the other, load balancers understand networking protocols, so they can integrate with networks effectively[1]. By deploying the load balancer, we can immediately gain several benefits:

1. Flexibility. Load Balancing allows the addition and removal of servers to a site at any time, and the effect is immediate. Among other advantages, this allows for the maintenance of any machine, even during peak hours with little or no impact to the site. A load balancer can also intelligently direct traffic using cookies, URL parsing, static and dynamic algorithms, and much more[3].

2. High availability. Load Balancing can check the status of the available servers, take any nonresponding servers out of the rotation, and put them in rotation when they are functioning again. This is automatic, requiring no intervention by an administrator. Also, the load balancers themselves usually come in a redundant configuration, employing more than one unit in case any one unit fails[3].

3. Scalability. Since Load Balancing distributes load among many servers, all that is needed to increase the serving power of a site is to add more servers. This can be very economical, since many small- to medium-sized servers can be much less expensive than a few high-end servers. Also, when site load increases, servers can be brought up immediately to handle the increase in traffic[3].

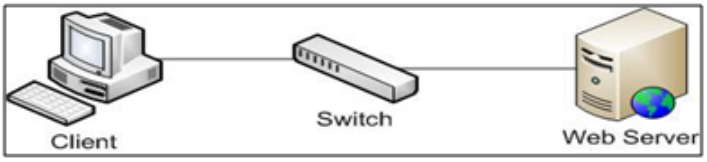

Figure 2: List of news aggregator

Table 1: Single Web Server Hardware Specifications

Device	Quantity	Specifications
Web Server	1	Processor Intel Dual Core 2,6 GHz
		RAM DDR2 2 GB
		Hardisk SATA 250 GB
		1 LAN Card Fast Ethernet
Client	1	Processor Intel Dual Core 1,6 GHz
		RAM DDR2 1 GB
		Hardisk SATA 250 GB
		1 LAN Card Fast Ethernet
Switch	1	Unmanageable Fast Ethernet Switch 16 Port

2 RESEARCH METHODOLOGY

2.1 Web Server Performance Test

From Figure 2 and Figure 3 below is a network topology of Single Web Server and Load Balancing Web Server, there is a client that serves to test the website on a web server using assistive applications. At the time of the test, there is a switch that serves to connect the network between the client and the server. And for the single web server using 1 machine as a Web Server, Web Server Load Balancing using 2 machine as a web server and 1 machine functions as a Load Balancer. The design of the network topology is implemented for this study are as follows:

The hardware used in this study consisted of computer servers, client computers, switches and other network devices such as in Table 1 for a Single Web Server and table 2 for a Load Balancing Web Server.

CPU usage (%) and RAM usage (MiB) is done by using an application for resource monitors that run on the Web Server. At this stage of testing is done by running the Stress Meter application Apache JMeter on the client computer to simulate the load request respectively 50, 100, 250 and 500. This testing will be performed using each of the bandwidth is 512 Kbps, 2 Mbps, 5 Mbps and 10 Mbps to measure how much performance difference.

The next test is to measure the Request Response Time and Fail. Response time in question is how much time (milliseconds) when a Web server responds to any requests that come from the client. To Fail Request in question is what percentage of the number of clients who have failed in a request to the Web server (%). The test is performed by using the help of an application using Apache JMeter is executed on the client, the Web server to the load

Table 2: Load Balancing Web Server Hardware Specifications

Device	Quantity	Specifications
Web Server	2	Processor Intel Dual Core 2,6 GHz
		RAM DDR2 2 GB
		Hardisk SATA 250 GB
		1 LAN Card Fast Ethernet
Load Balancer	1	Processor Intel Dual Core 2,6 GHz
		RAM DDR2 2 GB
		Hardisk SATA 250 GB
		1 LAN Card Fast Ethernet
Client	1	Processor Intel Dual Core 1,6 GHz
		RAM DDR2 1 GB
		Hardisk SATA 250 GB
		1 LAN Card Fast Ethernet
Switch	1	Unmanageable Fast Ethernet Switch 16 Port

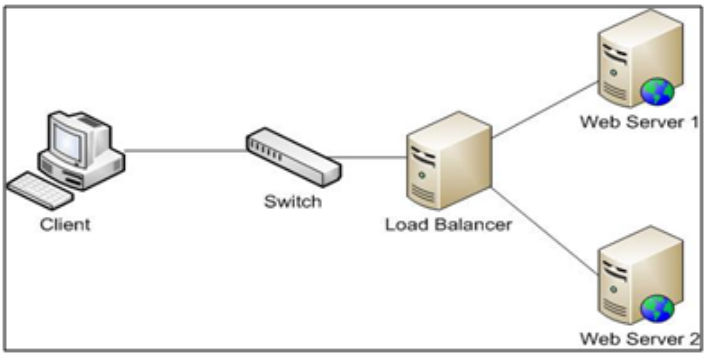

Figure 3: List of news based on categories

carried each with a request number 50, 100, 250 and 500. Once charged to the Web server is then obtained: Average number of response time (millisecond) and Fail Request (%) of the test results.

3 RESULT AND DISCUSSION

3.1 Performance Single Web Server to Load Balancing Web Server

3.1.1 CPU Usage

From both the results obtained (Table 3 and Figure 4) and the comparison between Single Web Server with Load Balancing Web Server, that the bandwidth is too small to affect the client and server latency indirectly also affect CPU usage. Another thing that is obtained is ideally a single Web server according to the specifications of the hardware that has been mentioned previously is able to handle a load of 100 requests well in some conditions the

Table 3: CPU Usage of Single Web Server and Load Balancing Web Server

Band-width	Ave. CPU WST 50(%)	Ave. CPU WSLB 50(%)	Ave. CPU WST 100(%)	Ave. CPU WSLB 100(%)	Ave. CPU WST 250(%)	Ave. CPU WSLB 250(%)	Ave. CPU WST 500(%)	Ave. CPU WSLB 500(%)
512 Kbps	69,8	36,4	93,9	53,55	100	89,95	100	100
2 Mbps	97	49,35	100	70	100	94,35	100	100
5 Mbps	100	83,7	100	86,3	100	96,35	100	100
10 Mbps	100	92,85	100	96,85	100	100	100	100

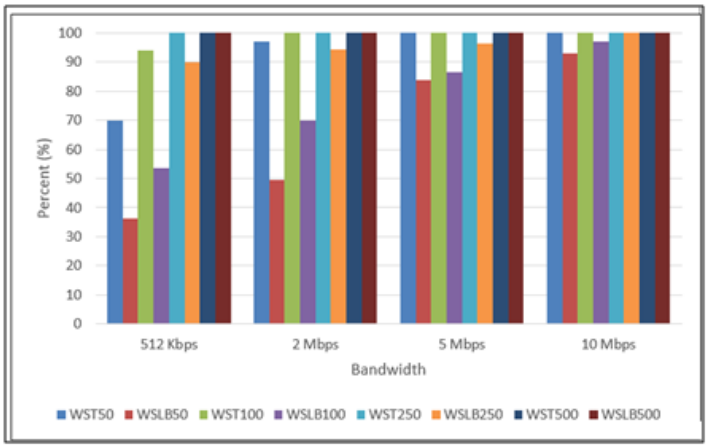

Figure 4: List of news based on categories

bandwidth that has been tested. And for Web Server Load Balancing in accordance with the previously mentioned hardware is capable of handling the load is 250 requests well in some conditions the bandwidth that has been tested. Both of these things, it can also be concluded that there is an increase in handling requests from Web Server Load Balancing Web Server Single compared with the magnitude of improvement of approximately 150%.

3.2 RAM Usage

When compared to the use of RAM (Table 4 and Figure 5), in contrast to the increased CPU usage which reached approximately 150%, then this is not the case with the use of RAM, although the data obtained from the use of RAM Web Server Load Balancing less (better) compared with a single web server, but the difference was not significant. It can be concluded that the use of the RAM between Single Web servers and Load Balancing Web Server did not differ, although the actual physical RAM belongs Load Balancing Web Server has a capacity of 2 times the RAM Single Web Server.

3.3 Average Response Time to Fail Request

From the test results ranging from 50, 100, 250 and 500 requests (Figure 6), each of the stages by limiting the bandwidth used, the test has met the ideal and maximum load,

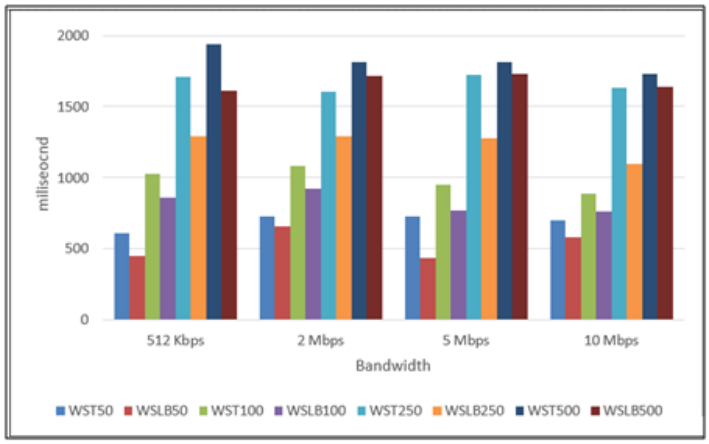

Figure 5: List of news based on categories

Table 4: RAM Usage of Single Web Server and Load Balancing Web Server

Band-width	Ave. RAM WST 50(%)	Ave. RAM WSLB 50(%)	Ave. RAM WST 100(%)	Ave. RAM WSLB 100(%)	Ave. RAM WST 250(%)	Ave. RAM WSLB 250(%)	Ave. RAM WST 500(%)	Ave. RAM WSLB 500(%)
512 Kbps	611	449	1028	859	1705	1288,5	1936	1610
2 Mbps	729	656,5	1083	925,5	1607	1290,5	1815	1714
5 Mbps	729	438	948	772	1721	1280	1812	1726,5
10 Mbps	700	583	890	761,5	1634	1099,5	1728	1638

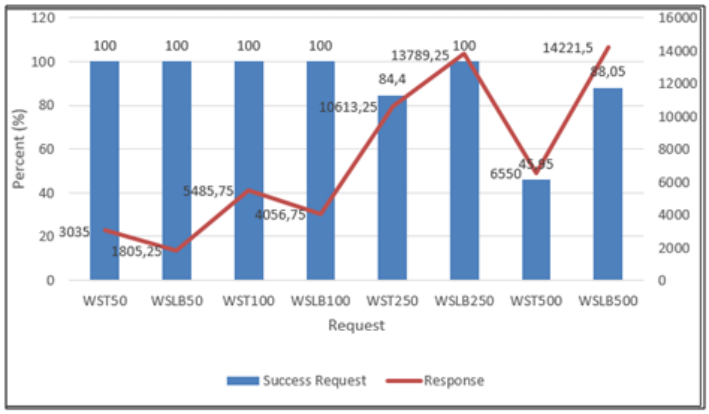

Figure 6: List of news based on categories

respectively. From this writer tried to draw the conclusion that the CPU load was very role to influence the ability of a Web server to serve the number of requests are coming, along with the RAM usage also become indispensable to assist in the performance of the CPU service requests are coming. From these two parameters, namely the use of CPU and RAM will determine the success of request and response time of a Web server. So if the CPU and RAM utilization is not maximized, it is possible that the web server is still able to serve requests are coming.

4 CONCLUSION

After testing has been done in this paper, now can be conclusion that, Load Balancing Web Server can serve more requests are coming and have the reponse time better than Single Web server. Load Balancer can divide the workload on both web servers evenly. And, the size of the bandwidth effect on response time, due to the size of the bandwidth affects the latency of a server to a client when accessed. The greater the bandwidth, the better it will be owned by the response time to the server.

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