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Availability Analysis with Failover Computer Cluster Method

Case Study in Academic Information System of UIN Sunan Kalijaga

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Abstract - High-performance academic information systems and high availability services are requirement in every university. One of many reasons is for anticipation damage and fail server disrupting server network performance. Failover computer cluster method is applied to two servers: primary server as main server and secondary server as backup server. Four stages will be carried out: First: Installation and support software configuration. Second: installation and failover cluster configuration. Third: installation and Distributed Replicated Block Devices (DRBD) configuration. Forth: server testing with siege and nettool.

This research conducted by doing server test before and after high availability. As if the main server has a system failure, it will automatically backup the main server to backup server to minimize user accessed data failures. System uses Ubuntu 16.04 LTS operating system. Based on the test data, it is acquired two data: packet data and data response time (ms). Data packets acquired from this research are: 233.3 average data sent; 228.3 average data received; 2.3 average data lost; while 59.7 average response time (ms) is showed; 2.7 minimum average; 633.8 maximum average. Data sent is 120B per data.

Keywords: ***Cluster, Failover, Availability, Data Backup***

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I. INTRODUCTION

Academic Information System infrastructure is a requirement in educational institution. An important services demand a rapid data processing are essential. Therefore the information is not obsolete, unarguably fast, and accurate. Also the ability to survive under any conditions is a common demand. High-performance academic information systems and high availability services are demand from stakeholder.

Server known to experience damage service and corrupt calculation, therefore it's required a backup server replaces main server function. It takes two servers combined into the cluster. This technology used as an damage and failure anticipation computer server from server network disrupting performance.

High availability level Information System required a well-calculated plan. High availability systems qualifies requirements such as, continuous services and also data requests consistency . [1]

One of expected high availability approaches is to handle these problems by using clustering. Clusters defined as subsystem storage communicates with each other for sharing and accessing resources (Lowe, 2005). Network system disruptions are caused by active main server are down and or no backup server replaces the main server function resulting. One of the main solutions to overcome this problem is to use failover clustering server.

Main function in failover clustering is to answer needs in high availability servers and help maintain client access to server resources. This concept is one of the best solutions to be implemented if there are server failure or server damage. Failover system is one way to overcome unexpected conditions, if such event occurs which resulting main system down. One solution is to create a server repository by combining High Availability (HA) availability, update speed and installation technology process are well maintained.

According to Paudyal (2011), high availability services requirementi is have performance speed, scalable and distributed data. To apply it, several methods applied such as separating data storage. Data storage can be divided into several nodes. This is related to data distribution mechanism used by the system in dividing data stored in several nodes. Website requires high availability level because it is a must-ready service. Services not only come from users who access the website but can be data indexing by search engines, retrieval engines and etc. [2]

Based on this background, this research title is "Availability Analysis of Academic Information System in UIN Sunan Kalijaga Yogyakarta Using Failover Computer Cluster Method".

II. RESEARCH METHODOLOGY

The study was made to analyze the existing methods in making observations on increasing data backup in the Academic Information System. After finding several methods, it will be compared and find the method that is closest to the valid value.

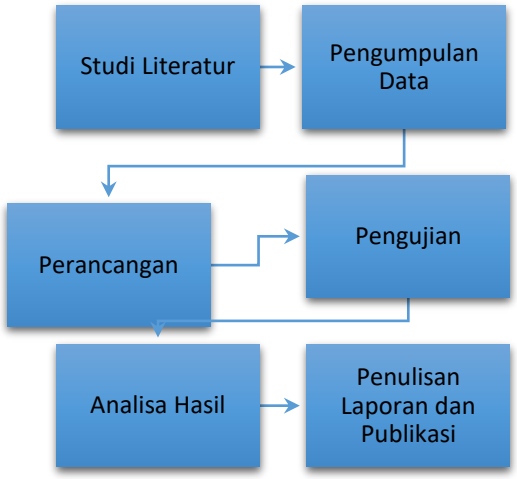

Figure 1 Research Method

Details of the two networks will be made as follows:

1. Network 1: 192.168.1.2 (main server)
2. Network 2: 192.168.1.3 (server backup)

The software used to make failover cluster virtualization is as follows:

1. Operating system: Ubuntu 16.04 LTS
2. Web server: Apache web server.
3. Backup and recovery: Distributed Replicated Block Device (DRBD) and Heatbeat.
4. Pacemaker
5. Load testing: Siege and netTools

After all the data needed is fulfilled, the installation and configuration of the failover virtual cluster is ready to be carried out through the following three main stages:

1. Installation and configuration of supporting software.
2. Installation and configuration of failover clusters.
3. DRBD installation and configuration

III. RESULT AND DISCUSSION

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The study entitled "Availability Analysis Academic Information System of Sunan Kalijaga State Islamic University in Yogyakarta Using the Failover Computer Cluster Method" was completed on April 28, 2017. This study uses the failover computer cluster method. This research was conducted in five stages, the first was the installation of the Ubuntu 16.04 LTS Operating System on two computers. The Ubuntu Operating System is used because this operating system has a lot and is easy to use, the second stage is the installation of a Web server that is Apache web server and MySQL. The third stage is the installation of Backup and recovery, Distributed Replicated Block Device (DRBD) and Heartbeat. The fourth stage is installed Pacemaker to connect between two Ethernet computers so that they are interconnected and can exchange information to share data. After the four stages have been successfully carried out, the last stage in this study is testing the load on the server availability and server load by sending 1000 data packets on the server and tested using the Siege and netTools applications. The experiment was carried out 10 times with each 5-minute trial on the main server of Sunan Kalijaga State Islamic University.

The system that has been implemented is tested to ensure that the system built can run with proper conditions. Testing is carried out by giving a test case against various possibilities in the system.

3.1 Availability analysis

This availability test taken place neither before nor after system failure, but for observing whether the server service running when virtual server is fail..

The test carried out by giving the testing deadline according to test. Test limit by minutes or in testing hour units. In this case, we set time limit to 5 minutes by sending 1000 data packets in each test shown in table 4.1

Table 4.1 Table of server testing before failover

NO	Packet/sec	Packet					Responsive Time (ms)			Packet Size
		Sent	Received	% Received	Lost	% Lost	Average	Min	Max	
1	1000	305	184	60	121	40	971	912	1000	120
2	1000	307	167	54	140	46	969	897	1000	120
3	1000	316	230	73	86	27	957	898	1000	120
4	1000	307	167	54	140	46	964	877	1000	120
5	1000	319	130	43	183	57	979	925	1000	120
6	1000	308	96	31	212	69	979	920	1000	120
7	1000	307	86	28	221	72	979	932	1000	120
8	1000	303	90	30	213	70	984	937	1000	120
9	1000	306	71	23	235	77	984	941	1000	120
10	1000	306	71	23	235	77	984	941	1000	120
MAX		319	230	73	235	77	984	941	1000	120
MIN		303	71	23	86	27	957	877	1000	120
Rata-rata		308,4	129,2	41,9	178,6	58,1	975	918	1000	120
SD		5,038	55,077	17,502	53,073	17,502	9,357	21,669	0	0
batas bawah		303,4	74,1	24,4	125,5	40,6	965,6	896,3	1000	120
batas atas		313,4	184,3	59,4	231,7	75,6	984,4	939,7	1000	120

The next stage is an experiment on the backup server. It sent 1000 packets for 5 minutes in table 4.2

Table 4.2 Calculation table for server testing after failover

NO	Packet/sec	Packet					Responsive Time (ms)			Packet Size
		Sent	Received	% Received	Lost	% Lost	Average	Min	Max	
1	1000	310	308	99	2	1	89	2	711	120
2	1000	310	307	99	3	1	32	2	996	120
3	1000	307	305	99	2	1	88	5	978	120
4	1000	316	306	97	10	3	103	2	866	120
5	1000	308	306	99	2	1	91	4	757	120
6	1000	153	152	99	1	1	93	5	752	120
7	1000	152	125	100	0	0	61	1	481	120
8	1000	150	149	99	1	1	6	2	46	120
9	1000	160	160	100	0	0	20	2	528	120
10	1000	167	165	99	1	1	14	2	223	120
MAX		316	308	100	10	3	103	5	996	120
MIN		150	125	97	0	0	6	1	46	120
Rata-rata		233,3	228,3	99	2,2	1	59,7	2,7	633,8	120
SD		81,2281	82,96994	0,8165	2,898	0,816	37,9182	1,4181	314,0233	0
batas bawah		152,1	145,300	98,2	-0,7	0,2	21,8	1,3	319,8	120
batas atas		314,5	311,3	99,8	5,1	1,8	97,6	4,1	947,8	120

Based on the comparison of the two tables above, there are more lost data in the first table, main server with no backup server. It is because server availability is still not high enough and low backup ability. Therefore, out of the 10 data retrieve from server testing, the percentage lost reached 77%. The second trial is an experiment after a backup server failover on the server is applied. From the first data to the tenth data, the percentage of lost is 1%, except in the fourth data it reaches 3%. This test was considered successful

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because 9 out of 10 data tested on the server resulted in a percentage of lost data reaching 1%. It is considered as high availability requirements. This test is conducted to test initial server before and after applying high availability. If the main server has a system failure, the backup server will automatically backup the main server to the backup server to minimize data failures accessed by the user. Data failure will resolved by backup server once there is power outages, human error or natural disasters.

IV. CONCLUSION AND SUGGESTION

A. Conclusions

From this research, the conclusion are:

1. 1. Based on a failover cluster computer method with Distributed Replicated Block Device approach, it can perform the proper function ifserver system failure, so that the service can still run properly guaranteed by using computer failover cluster system.
2. The cluster configuration and work show better results than system outside cluster from terms of availability in system failure (failure) by increasing availability level of generating a percentage from 77% to 1% on backup server.
3. 2. After failover clustering, the level of Availability Web Server reaches 99% and Web Server Load Test reaches 99% data received and 1% data failure. Based on test result, the system be able to serve transactions by sending 1000 data packets based on a 5 minutes length time for every 10 attempt and produces 99% of data packets received and 1% data failure packages.

B. Suggestions

Based on testing from this research, there are many shortcomings in the system for better performance. Following are some suggestions that can be submitted for further development, including:

1. Research is carried out using a real server device.
2. Using different types of services like real time services.
3. Use more than one type of service in a cluster.
4. Using active / active or load-sharing mode on load balancer.
5. For educational institutions like schools and universities, server virtualization systems can be used as a solution to conduct research with various operating systems without having to provide a server machine for an operating system.

REFERENCES

[1] Coularius, G., Dallimore,J., & Kindberg, Distributed System Concept and Design Fifth Edition, Pearson Education Inc, 2012.

[2] U. Paudyal, Scalable Web Application using node.JS and CaouchDB. Institutionen for information technology, Department of Informatioan Technology, Sweden: Uppsala, 2011.

[3] Amran, Yobioktabera, Designing a High Availability System in the Academic Information System of Muhammadiyah University Semarang Based on Mysql Cluster, Dian Nuswantoro University, 2013.

[4] Andragini, Muhammad Rivai, Linux HA Guide & Failover on OpenSUSE/SLES, 2010.

[5] Anglos, H. & Ariono, "Analyzing High Availability and Continous TCP Using Open Ais and TCPCP," in *4th International Service Availability Sysmposium*, Durham, 2007.

[6] Dale, N., Lewis, J., Computer Science Illminated, Jones and Bartlett Publishers: Canada, 2002.

[7] Drake, et al, Architectur og highly available databse, Springer-Verlag, 2005.

[8] J. Fulmer, "Siege," 2012. [Online]. Available: http://www.joedog.org/siege-home/. [Accessed 20 February 2017].

[9] Hlman. B., Haas, F.,, Highly Available iSCSI Storage wit DBRD and Racemaker, LINBIT HA-Solution GmbH, 2011.

[10] [Online]. Available: 10) http://www.vavai.com/wp-content/uploads/panduan-high-availability-server-mengunakan-opensuse-sles.pdf . [Accessed 15 December 2016].

[11] Chen, Y.Y.,Chen,C.,Huang,C.Y.,, "Experience in Developing a High Availability and Continous TCP Using OpenAis and TCPCP," in *4th International Service Availability Symposium*, Durham, 2007.

[12] [Online]. Available: http://www.webdevelopernotes.com/basics/what_is_web_server.php. [Accessed 10 February 2017].

[13] Irfani, Implementation of High Availability Server with a Virtual Computer Cluster Failover Technique, Muhamadiyah Surakarta University, 2015.

[14] Irianto, Gatot, Implementation og hight availability server by using loadbalance,failover,and database resunancy, Sebelas Maret University, 2015.

[15] ITU-T Standarization E.860, Framework of a Srvice Level Agreement, 2002.

[16] Juliharta Krisna, Wayan Supedana and Hostiadi, High Availability Open Source Based Web Servers with Failover Clustering Techniques, Bali: STIMK STIKOM, 2015.

[17] Jung, S.J., Bae, Y. M., Soh, W.,, "Web Analysis Performance Analysis of Open SOurce Server Virtualization Techniques," *International Journal of Multimedia and Ubiquitous Engineeringg* , vol. 6, no. 4, 2011.

[18] Mohammad Faruq Afif, Tito Suryono, "Implementation of Disaster Recovery Plan with a Failover System Using DDrbd," 2013.

[19] Sebelas Maret University, "Heartbeat in the UNS Fkip Data Center,"

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Indonesia Journal on Networking and Security (IJNS), vol. 2, no. 2, 2011.

[20] Mulyanto, "Implementation of High Available Website with Distributed Replicated Block Device Case Study : New Student Admissions Website Muhammadiyah Riau University," 2015.

[21] Prasetyo, Helmi, High Availability Server Storage Using the DRBD and Heartbeat Applications Based on the Centos 6.5 Operating System on the WAN Network, Mercu Buana University Jakarta, 2014.

[22] M. Sharma, What is a web server, 2010.

[23] Sukarindhoto, S., Funabki, N., Pramadihanto, D, "A Comparative Study of Open Source Software for for Virtualization with Streaming Server Applications," in *The 13th IEEE International Symposium on Consumer Electronics (ISCE2009)*, 2009.

[24] Saenal, Muhammad Taufik, "Implementation of High Availability Clusters in Implementing Cirtual Servers Using Proxmox Virtual Environment," in *Pasundan University Bandung*, 2014.

[25] Syamsuhadi M , Vivi Sahfitri , Suryayusra, "Implementation of High Availability Servers with Failover Computer Cluster," 2012.

[26] "Tchniques at Uptsim Bina Darma University," in *Bina Darma University*.

[27] Tanenbaum, A S, Steen , M V, Distributed System Principles and Paradigms, Prentice Hall, 2002.

[28] Thein T, Win, T.T.L, "High Availability Cluster System for Local DIsaster Recovery with Markov Modeling Approach," *International Journal of Computer Science Myanmar*, 2009.

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