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Performance Analysis of Multiple-Computer as Real Application Clusters (RAC) Based on Storage Area Network (SAN)

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Abstract

Real Application Cluster (RAC) is a method to design a network that is used in large scale database which can handle full service all year round. RAC allows the pooling Server nodes in parallel and improve the Performance of each Server to be faster. RAC runs in multiple-computers. RAC was implemented with the support of Storage Area Network. Storage Area Network (SAN) is a high-speed dedicated network consisting of Servers and Storage. In general, SAN is connected via Fibre Channel (FC), UTP cable was used in implementation. Storage Area Network (SAN) was applied in clustering blocks device for high availability. Each block device will backup each other. SAN primary goal is to handle the density of large amounts of data between servers and storage without reducing the bandwidth available on the LAN/WAN. The integration uses three computers (hardware), DRBD package and Management Console (MC). Based on the results obtained by testing the availability is 100%. While the Clustering Performance obtained is 100% (The SANs Performance 93.396%, The Main and Cluster Server Performance 29.4945%).

Keywords : *Real Application Cluster, Server, multiple-computer, Storage area network, high Performance and high availability*

1 INTRODUCTION

The needs and demand of the modern application era changed in the sense it is not only requires computing resources (processing power, memory or disk space), but also the ability to remain available to handle user requests service almost continuously all year (Hartman, 1999). The Needs and demand of today's research applications. This research depends on some materials including the performance of the client and server computers, data transfer speed (Read/Write), and compatibility of hardware and software (Buyya, 2009).

The design of the computer usage in relation to the Cluster Server is the servers capability to share the performance of a number of servers (multiple) in one process (Taylor, 2003). If single server was used, no guarantee the server will always active. Therefore, it takes a cluster

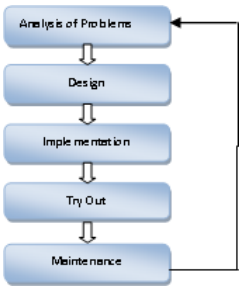

Figure 1: Flowchart of RAC on SAN

method to deal with such matters, so that when one server fails (down-time, offline, or failure) then the Server failover occurred in the set-up Cluster Server. Cluster servers are typically built with the same location. To integrate the SAN with Real Application Clusters (RAC) method based Storage Area Network (SAN). RAC works in high availability, which means the demand data, will be directly addressed by all servers in the node RAC to work together (Dyke, 2006).

RAC was designed to run on multiple-computer. Multiple-computer usually built by servers in the same location (Aizikowitz, 2005). RAC is the course to support the necessary method of SAN. SANs advantage is that every server can be accessed remotely with the best reliability. The program supported by the operating system will allow the Main and Cluster Server to share files (Hui, 2004). SAN is a very high speed networks, consists of Server and Storage. Separate and distinct from the corporate LAN or WAN, SAN primary purpose is to handle large amounts of data traffic between servers and storage equipment, without reducing the bandwidth available on the LAN or WAN. Usually connected via Fiber Channel, a technology is very high-speed data communications, making SANs a dedicated network that is platform-independent operating behind the Server. SAN consists of communications infrastructure, which provides physical connections, and layers of management, which control connection, storage element, and the computer system so as to produce a highly secure data transfer and reliable (Liu, 2009).

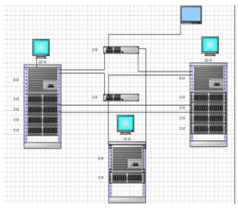

Figure 2: Layout of RAC on SAN

2 LITERATURE STUDY REAL APPLICATION CLUSTER (RAC) ON STORAGE AREA NETWORK (SAN)

In this section some basic theory used in the implementation of this system.

2.1 Multiple-Computer Cluster

Multiple-Computer Cluster is a collection of some servers which are connected to each other to form a single entity (Cluster). Computer cluster task is currently running to share the workload so as to increase the availability (Serrelis, 2007). Besides, Multiple-Computer Cluster are used to improve the performance when the event of disaster occured (there is one server down/failure) then the failover will quickly run to turn a RAC where other Cluster Server will run the task of failover servers that have failed. Multiple-Computer Cluster is often also associated with a data center, because the data center consists of a set of Server and Storage. The data center is a facility that is used to place multiple servers or computer systems and data storage systems. Data centers can also be viewed as a data repository (data warehouse) that serves as a data management system starting from the collecting, processing, storage until the rediscovery of the data, and be able to also provide support in decision making (Thompson, 2003).

2.2 SAN

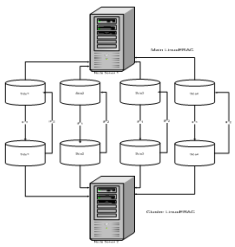

Figure 3: Configuration of RAC

Storage Area Network (SAN) is a very high speed networks in particular, consists of server and storage (Qui, 2005). Separate and distinct from the LAN/WAN Company, the main purpose is to handle traffic SAN large amounts of data between servers and storage equipment, without reducing the bandwidth available on the LAN/WAN (Calves, 2004). Usually connected via Fiber Channel, a very high-speed data communications technology, making SANs a dedicated network that is platform-independent operating behind the Server. SAN consists of communications infrastructure, which provides physical connections, and layers of management, which set up the connection, storage element, and the computer system so as to produce a highly secure data transfer and reliable (Chen, 2005). SAN consists of communications infrastructure, which provides physical connections, and layers of management, which set up the connection, storage element, and the computer system so as to produce a highly secure data transfer and reliable (Vasudeva, 2000).

2.3 RAC

RAC is a method for designing large-scale database that can handle 24-hour service (Greenwald, 2007). RAC is possible to bring together many servers in parallel and improve the performance of each server to be faster. That is because in RAC, regardless of the number of existing servers will be only one Server. RAC is working in high availability, which means

the demand data will be directly addressed by all servers in the node RAC to work together (Mahalingam, 2009).

2.4 SYSTEM DESIGN

Work methods or steps performed in installing Real Application Cluster (RAC) by using the Storage Foundation are:

The first stage should be done is to analyze the problem in regard to the use of the Storage Foundation Enterprise Linux Real Application Clusters by doing a short test to find out the weakness of the system. SAN is the biggest part in designing the architecture RAC DRBD. In this section, we prepare all the hardware that supports the need for system requirements. This includes determining the number of nodes that will be implemented, determine the operating system, processor and memory and LAN network design, network design interconected, network design for the database to the IP addressing (public ip, virtual ip and private ip). After the design process is done, the logical design is shown. Mentioned earlier in the logical system synchronization occurs when the server is active/active (Main Server and Cluster Server). RAC is running the synchronization.

RAC has two servers, or nodes, namely node 1 and node 2 and consists of a Storage Foundation RAC, it can be seen on Figure 2. Each server or node has four NIC card. NIC card is used to connect to each server/node, connecting node 1 to node 2 (peer-peer connection) and connect the second Server with Storage Foundation Real Application Cluster. Server/node has more than one NIC because if there are interference or a fault in one of the NIC to another NIC to work. Host Bus Adapter (HBA) was used to connect a server/node with Fibre Channel (FC) which is connected to the Storag/hard drive. By using the node and more than one NIC then RAC has high availability.

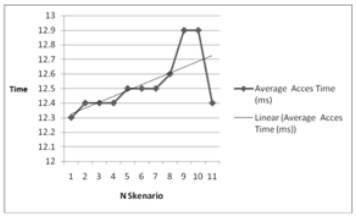

Figure 4: Average access time of service

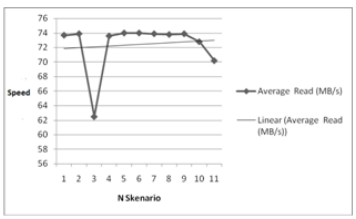

Figure 5: Average Speed of Reading Disk

At the Application Client sends a request, the request will be submitted to the server/node through Local Area Network (LAN) connected to the switch and the switch has been connected to the server/node. After a request to each server/node then the server/node will identify and send the request to the storage/harddisk, then the next client request Application will be answered and sent to the client.

Figure 3 shows the redundancy of SAN. The data contained in the node 1 will also be on node 2, if there are problems at node 1 then node 2 will meet customer demand and the customer does not need to be queue or cannot access the request. With the data on node 1 and node 2 then Server/node will never stop. Server/Client Application nodes connected by using a public IP, while between node 1 and node 2 is connected with a private IP. Each node also uses a virtual IP because the virtual IP address used alternative public client in addition to the standard IP address. Otherwise virtual IP can be said IP multipathing, which can recognize the public IP and private IP.

3 SIMULATION RESULTS

Those testing carried out in several scenarios. For the first scenario is testing Storage (disk), measuring the performance of Redundant Array of Independent Disks (RAID). On the measurement of the variation in the RAID configuration of each server such as RAID 6 for each node Server (Main Server and Cluster Server) and RAID 0 for Storage Foundation Enterprise Linux Real Application Clusters. Both measurements were taken from the Performance Memory, I/O and CPU. Final analysis is to observe the real Enterprise linux Application Cluster (RAC).

DRBD RAID mechanism is analogous to the duplicating data across the network. Duplication of data is done in the mechanism of block devices, not in the form of raw data. When RAID duplicates the content and data of a hard disk or partition to another hard drive or partition, DRBD does the same thing, only done through the network. DRBD and RAID hard drives are mutually supportive. DRBD has one advantage over RAID hard drive, which is a separate backup server with a backup source. This separation brings preventive benefits, if there is a problem on one server, another server will act as a server replacement. If the primary server has recovered, the control will be returned to the main server.

Where: MTTR = 0, MTTR ignored because every time down time directly in the takeover by Cluster Server so that the services remain the way as it should without any delay. Thus:

$$MTBF = MTFF$$

$$Availability = MTFF/MTBF = 100\%.$$

4 CONCLUSION

Real Application Clusters (RAC) is a method for designing large-scale database that can handle 24-hour service. RAC allows many servers in parallel to unify and improve the performance of each server to be faster. Availability and performance comparable to the ratio of the instantaneous failure occurs with the average time taken in the recovery process. Performance comparison of the results obtained from the packets transmitted by the number of packets sent. SAN Performance = 93.396%, Main and Cluster Server Performance =

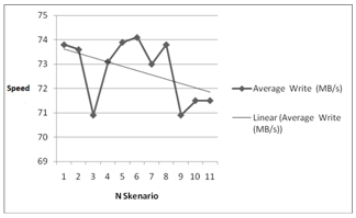

Figure 6: Average Speed of Writing Disk

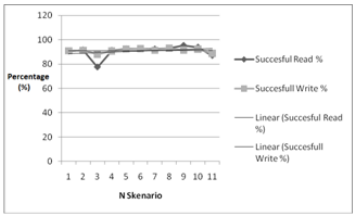

Figure 7: Successful Rate of Read / Write Service

29.4945%.SAN intended to serve clients with the support of both node server (Main and Cluster Server).

Write slower than Read when accesing the server and storage. When performing activities Read the process is not through the CPU and memory cache but directly to the Storage. Write activity while the process is going through the CPU, memory cache to the storage, so that Write is slower than the Read. Nowadays, RAC based on SAN can be operated on high end technology only and the maintenance cost also high. For further research, RAC based SAN can be operated for every data center with low cost.

5 ACKNOWLEDMENT

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