

SERVER CLUSTERING TECHNOLOGY & CONCEPT

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Abstract

Server Cluster is one of the clustering technologies; it is use for the improvement of the PC's performance; cluster use for the high performance of computing system. It is based on the model of the cluster architecture. This model is refers that how servers manage in the cluster. Server Cluster is available for the Microsoft windows server. This model does not require any cabling, it support the standard Windows Server 2003 and Windows 2000. These windows server is use for the local storage and for the media connection.

Keywords: *Cluster Server, load balancing, FTCS, Database Manager, Virtual IP, Asymmetric Cluster*

1. INTRODUCTION

Computer clustering use for PC's or UNIX workstations; these technology can help us to achieve the 99.999 availability. The major companies such as Microsoft, sun micro system are offering some clustering packages. These packages are offer the scalability and availability.

If we talk about of our personal computers, a cluster stores all the data on a hard disk. These data are manageable by the operating system. All of the clusters are located in a different location in the hard disk. So, when someone read the file the hole file is comes to you. But here you not aware that where is the cluster stored. So. The numbers of cluster which are stored in a hard disk are depending on the size of the FAT. In DOS 4.0, the size of the FAT entries is 16 bits and the maximum size is allowing is 65536.

Researchers at Duke University are working on the software called as cluster on demand. This is an operating system, which is use for the replaceable component. All are the component configured according to the user of the need.

Jess Chase is the professor of the Durham University; he worked in a software department.

He says "All the software application and the operating system are separate in a particular software environment", because when the server boot via network, the request goes to the database and database tells to the operating system to run, what are the software and policies to load.

Chase says "I'm not interested in license product. I'm interested to develop the open source application, so after that these applications can help to further universities and research labs.

The company IBM is much interested, Bill Tetzlaff, he is an engineer at IBM, and very familiar with the technology.

2. THEORY

2.1 Technology

Windows Server 2003 introduced the technology name as server fault tolerant technologies. In this technology one or more applications are running on the servers, these applications are configured to two or more application servers. These applications provide fault tolerance and load balancing.

The procedure of this technology is if one server fails and does not operate, the another server will take the role. This is the way that fault tolerance technology is working in server clustering.

In this technology every server runs the same application on the server, if any case one of the servers fails, the another server will automatically take the role. This is the concept of the "failover".

Some big companies such as Microsoft, here the windows server 2003 operating system helps us to provide the high availability and scalability. These applications also help us to improve the performance of our business. High availability provides the high percentage of the user application and the scalability is used to increase and decrease the capacity of computing.

Cluster Server works as "When two or more computers are working together, both are the computers providing the high level of availability and scalability and both are obtained in single computers. Availability is increased when one computer results in failure and the workload to another computer.

The windows server provides two types of clustering technologies:

- (1) Server Cluster
- (2) Network load Balancing

2.1.1 Server Cluster

Server Clusters are designed for that application that have running for higher memory state or frequently update all the data. These applications are known as state full application. Microsoft SQL Server 2000 and messaging application such as Microsoft Exchange Server 2003 are the example of state full application.

2.1.2 Network Load Balancing

Network load balancing are called as the stateless application because in this balancing they do not have a long state running memory. So, the data can change very frequently and the entire request has not been done.

3. ARCHITECTURE

There are basically two types of clustering architecture

3.1 Basic Architecture for Server Clusters

The Figure 1 shows a 4 node server cluster; all the four nodes are connected to the quorum data (single cluster device)

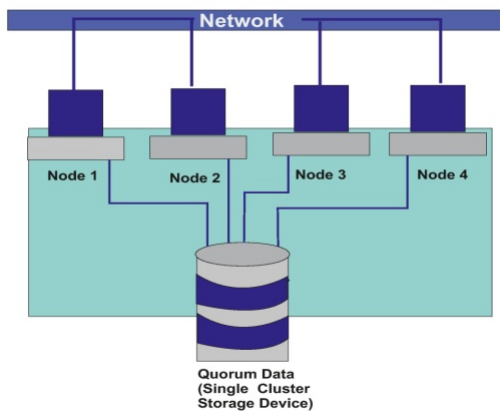


Figure 1: Source: <http://technet.microsoft.com/en-us/library>

This is called as single quorum device cluster because every disk in the array can manage one node at a time. These resources provide independent node, so that each node can obtained the data, if one more nodes are down. This type of connection is also called as bus.

3.2 Basic Architecture of Network Load Balancing Clusters

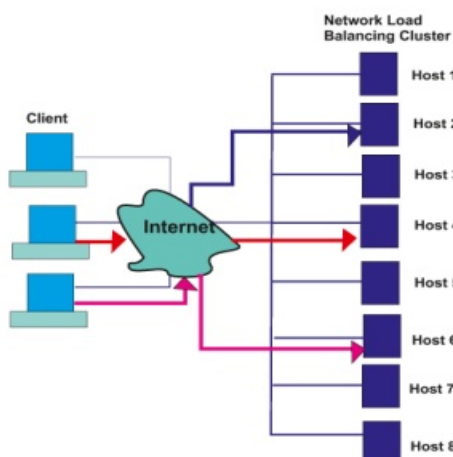


Figure 2: Source: <http://technet.microsoft.com/en-us/library>

Figure 2 shows a 8 hosts with the client are connected to the Network Load Balancing Cluster. Every host run as a separate copy of the server application, if a host failed; incoming client request goes to the other hosts in the cluster.

If one of the load increased, we needed the additional hosts. This server is very easy to install, manage and maintain because there is no need to the additional software, you can use the available software and hardware.

This type of architecture works as a virtual network adapter, every node represents a single cluster entities. In virtual adapter, every IP address and MAC address are different from each other. So the client uses only the virtual IP address. If the client sends a request to the cluster, all the nodes in the cluster will receive and process the message

4. PROCEDURE

4.1 EXPERIMENT

Computer and the software used in the experiments are shown in Table 1 and the overview of the environment is show in the figure 3 and 4

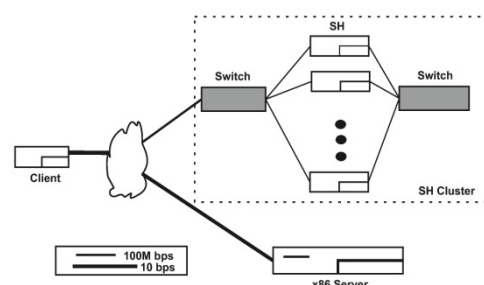


Figure 3: The environment used in experiments

SH 7780 Stand-alone (SH2007)	
CPU	R8A77800 (SH4A,400MHz)
Cache	L1 : 32KB D:32KB
Memory	128MB
Disk	HITACHI HTS 721010G9AT00 (2.5" IDE 100GB)
Ethernet Device	LAN9118 (10/100base-TX)*2
Kernel	Linux 2.6.21(sh)
Web Server	Apache/2.2.6
X86 server	
CPU	Xeon L5410(2.33GHz *4) TDP : 50W
Cache	L1 I :32KB ,L1 D:32 KBL2 : 6MB
Memory	4 GB
Disk	HP GB0500C8046 (3.5" SATA 50
kernel	Linux 2.6.18 (x86,64)
Web Server	Apache/2.2.3
Client	
CPU	Intel Core2 Duo U7700 (1.33GHz * 2)
Memory	2 GB
Ethernet Device	88E8055 PCIe Gigabit Ethernet
Kernel	Linux 2.6.25 (i386)
Httpperf	Httpperf-0.8

Table: 1 Computers and Software Used in Experiment

A server cluster is also called as SH computers. The cluster work as a single IP cluster server, so that the cluster's seen only the single computer by external clients. In the evaluation time only three types of servers are prepared, first one is the stand-alone SH server, second one is the SH cluster server and the last one is x86 server.

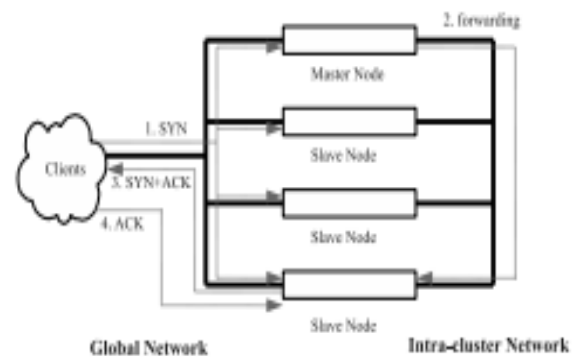


Figure 4: FTCS Overview

The httpperf benchmark is used as a benchmark, to measure the performance of the three types of server, when changing the http request rate. The httpperf benchmark is able to adjust the http request rate and the total number of connections which created, so first we set the total number of connections to 10 times, and the number of http request created by httpperf benchmark [4] in a second. This results run in a 10 second benchmark in a normal situation.

FTCS is used to make the SH Cluster in a single IP address cluster server. The Fig 1.5 showed the overview of the FTCS behavior. In the FTCS based cluster every incoming packet to the cluster is broadcast to all of the server nodes. At this there is one special node in the cluster known as master node. After the connection has been established, each node searches its own TCP connection.

4.2 COMPONENTS

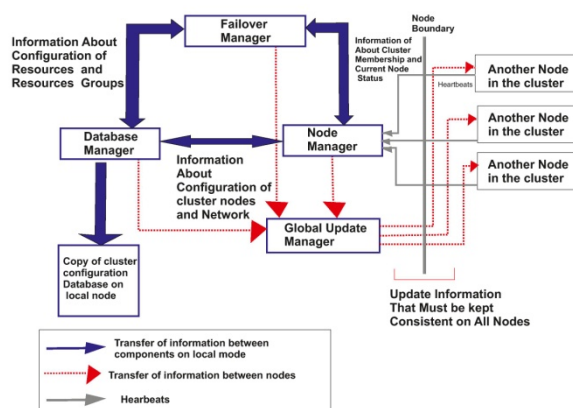


Figure 5: Source: <http://technet.microsoft.com/en-us/library>

Cluster Service runs on every node of a server cluster and controls all the server cluster operation. Multiple software components include in the cluster services and they work together. These components Fig 1.6 shows the Database Manager, Node Manager, Failover Manager, Resources Monitors and Global Update Manager.

Here the information is communicated between Database Manager, Node Manager and Failover Manager. The other, Global Update Manager is use to support the other three Managers by coordinating updates to the other nodes in the cluster. These four components are work together to make sure that all four nodes are maintained.

4.2.1 Database Manager

Database Manager maintains a local copy of cluster configuration database and runs on each node, so that all the information of logical and physical items stores in a cluster.

If the cluster wants to changes, the global update manager replicate all changes to the other nodes in the cluster. In this way all the consistent information is maintained, even if any case the node fails, the administrator have a source to changes the cluster configuration before the node return to service.

4.2.2 Node Manager

Node Manager is also use to maintain a local disk of nodes, network and network interface in the cluster. For the regular communication of nodes all nodes in the cluster have the same list of functional nodes.

In the cluster configuration database, node manager is uses to check the information and determine that which nodes have been added to the cluster or remove from the cluster. At the same instance it also checks the node failure activity, it is does because of the sending and receiving messages, and it is called as heartbeats. If the node detects that a communication failure with another node, it broadcast a messages to the entire cluster, this is called as regroup event.

4.2.3 Failover Manager and Resource Monitors

Failover Manager manage all the resource groups, for example, when the failover manager start or stops it's manage all the resource dependencies and perform certain

action between resource and failover manager. It also determines that which of the cluster have its own resource group because in the cluster, every failover manager works together and reassign the ownership of the resource group.

4.2.4 Global Update Manager

It is part of the internal cluster components, when a node is update, another node is appoint to monitor the update, this happens on all the nodes. If the appoint node is update locally, but the another node cannot be update, is removed from the list of the functional nodes, and change is mode on the available node.

5. Solutions

The solutions are provided is that; design your own application infrastructure. Mean design a good server cluster which is interconnected to two or more servers, thus all the resources provide availability, scalability or both.

The other two Solutions are:

5.1 Asymmetric Cluster

Asymmetric Cluster is also known as standby server; it exists when another server is failure. These clusters provide the high availability and scalability for understand the read/write stores. Fig 1.7 shows that if one of the nodes is unavailable, another node takes the role of the failure node.

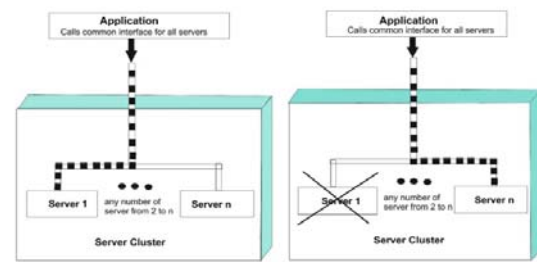


Figure 6: Asymmetric Cluster

5.2 Symmetric Cluster

In the Symmetric Cluster, every server known as the primary server, when one of the servers fails, the remaining server can continues to the process.

This is cost effective because more cluster resources use, so in the failure condition additional load is provide.

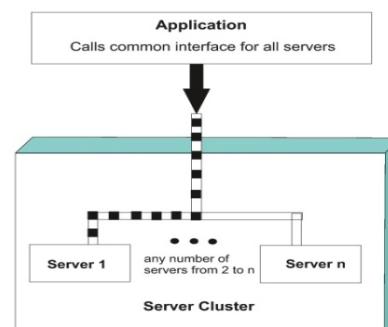


Figure 7: Symmetric cluster

6. CRITICAL ANALYSIS

Cluster Server has been used over a decade, the two processors name as Intel PIII (Tualatin) and the AMD Athlon (Thunderbird) These are the world HPC Clustering .In twice a year one of the best historical record of the HPC, because 500 machines are listed on the site. All the performance such as operating system, and architecture and the other factor that are recorded in the machine are included.

Attributes	Fall 2000	Fall 2009
Cluster Architecture	28 (5.6%)	417 (83.4)
Linux OS	54 (10.8%)	446 (89.2%)
X86 Family Processor	6 (1.2%)	438 (87.6%)

Table 2: Number of the machine that are clusters, use Linux, and x86 architecture in top 500.

If we look table 2, In 2000, cluster architecture, Linux operating system, and x86 processors are fall of 2000 But if we talk about in 2009, dominant changes in each of these.

When not sure about the system correctness, because the system is very complex, its too hard to prove its correction, so only assumption can we make. When one of the new synchronization problems is developing, the problems which introduced is development of distributed system. In this type of synchronization, activity and request can exclude each other. For those customers who want to configure the integration services as a cluster resource, the section contains the necessary configuration instruction. But in Microsoft does not recommend the integration services to configure in a cluster server.

7. Conclusion

Considering the Cluster Server, provide benefits such as, you pay the same price of

the cluster and you would share hosting. This will help us for the business purpose, because we save lots of money. You can purchase as much as computing power as much you want because you will have access to infinite number of the cluster servers. To sum up the cluster server can always help aid the network server environment at a much cheaper rate compared to that of buying an actual server. This is what companies do in order to function within a given budget they choose loosely coupled or tightly coupled cluster server systems in order to meet their need for processing information within their firm.

8. References

- [1] Network World, Infrastructure, and Researchers power up server clusters. P.21 Jennifer Mears, 2003.
- [2] Published by Kusu , The cluster Decade, 7 feb, 2010 Hpccommunity.org
- [3] Published by Adar, Cluster Server Technology, July11, 2010
- [4] D.Mosberger and T.Jin . Httpperf for measuring web server performance. P.31-37, 1998
- [5] Felicia R.Blue for Clustered Hosting Business.com
- [6]Server Cluster review, technet.microsoft.com
- [7] Network World, Infrastructure, and Researchers power up server clusters. P.21 Deni Connor 2003