# SERVER CLUSTERING: BEHAVIOR AND THEORY

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**Abstract**

Among the many clustering technologies, Server Cluster is most commonly used to boost PC speed. Clusters in general are useful for very fast computer systems. It follows the principle of the cluster design. This model describes the process by which servers are managed inside a cluster. Microsoft Windows Server supports server clustering. This type is compatible with both Windows 2000 and Windows Server 2003, and it doesn't need any cables. Local storage and media connections are handled by these Windows servers.

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

## 1. INTRODUCTION

Using computer clustering for personal computers or UNIX workstations, we may get a 99.999 availability rate. You may find clustering programs offered by big names in the industry like Microsoft and Sun Micro System. You can get scalability and availability with these bundles. In the context of desktop and laptop computers, a cluster is a collection of disks that hold all of the data. The operating system can handle these files. Every every cluster has its own unique spot on the hard drive. As a result, you will get the whole file when someone reads it. However, in this case, you do not know the exact location of the cluster. So. A hard drive's capacity to hold clusters is directly proportional to the size of its FAT. As of DOS 4.0, the largest permitted FAT entry size is 65,536 bytes, and their size is 16 bits. 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 userof 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 aparticular 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 Tetzlafl, he is an engineer at IBM, and very familiar with the technology.

## 2. THEORY

### 2.1 Technology

Windows Server 2003 introduced thetechnology name as server fault tolerant technologies. In this technology on or moreapplication are running on the servers, these application are configuring to two or moreapplication server. These applicationsprovide fault tolerance and load Balancing. The procedure of this technology are if oneserver fails and not operate, the anotherserver will take the role. This is the way thatfault tolerance technology is working inserver clustering.

In this technology every server runs the same application on the server, if any case one of the server fails, the another serverwill automatically take the role. This is the concept of the "failover".
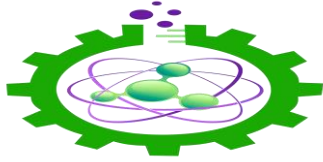
Some big companies such as Microsoft, Herethe windows server 2003 operating systemis help us to provide the high availability and scalability. These applications are also helpus to improve the performance of our business. High availability provides the high percentage of the user application and the scalability is use 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 result is 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 ofstate full application.

**2.1.2 Network Load Balancing**

Network load balancing are called as the stateless application because in this balancing they 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)
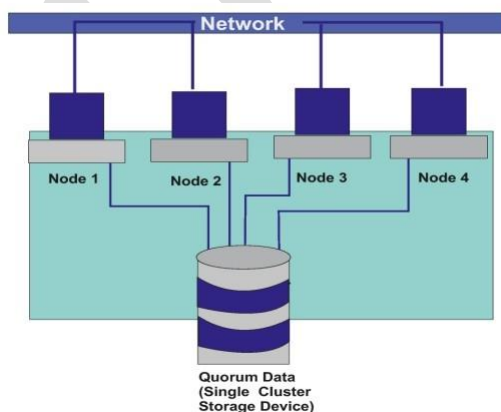
Figure 1: Source: http://technet.microsoft.com/en-us/library

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 canobtained the data, if one more nodes aredown. This type of connection is also called as bus.

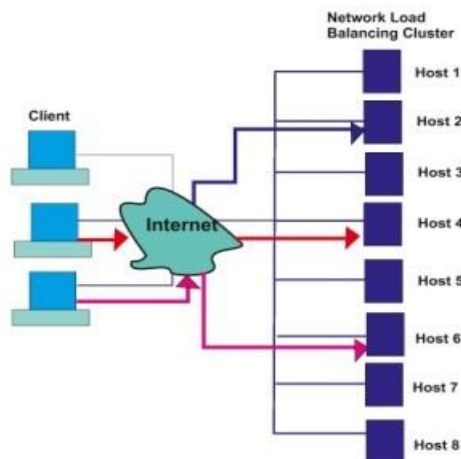### 3.2 Basic Architecture of Network LoadBalancing Clusters



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 BalancingCluster.
Every host run as a separate copy of the server application, if a host failed; incoming client request goes to the otherhosts 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 thereis no need to the additional software, you can use the available software andhardware.

This type of architecture works as a virtual network adapter, every node represents asingle 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 sendsa 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 theoverview of the environment is show in the figure 3 and 4
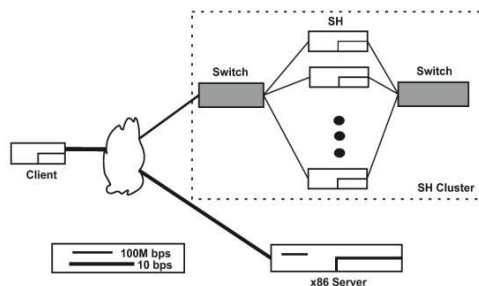
Figure 3: The environment used in experiments

| SH 7780 Stand-alone (SH2007) | |
|---|---|
| CPU | R8A77800 (SH4A,400MHz) |
| Cache | I : 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) |
| Httperf | Httperf-0.8 |
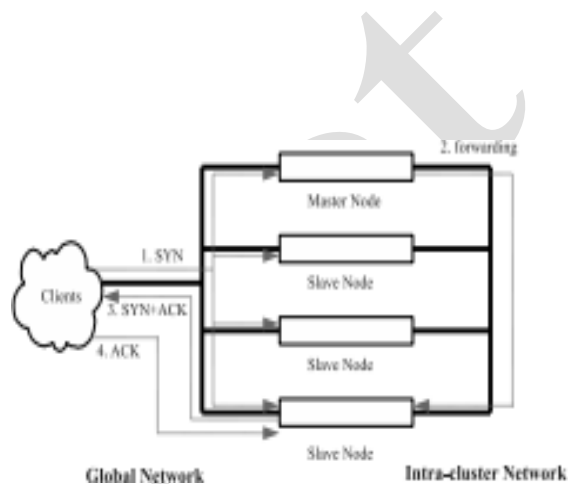


Figure 4: FTCS Overview

Table: 1 Computers and Software Used in Experiment

The httperf benchmark is used as a benchmark, to measure the performance of the three types

of server, when changing the http request rate. The httperf 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 httperf 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 incomingA server cluster is also called as SH computers. The cluster work as a single IP cluster server, so that the cluster's seen onlythe single computer by external clients. In the evaluation time only three types ofservers are prepared, first one is the stand- alone SH server, second one is the SH clusterserver and the last one is x86 server.packet to the cluster is broadcast to all ofthe 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.
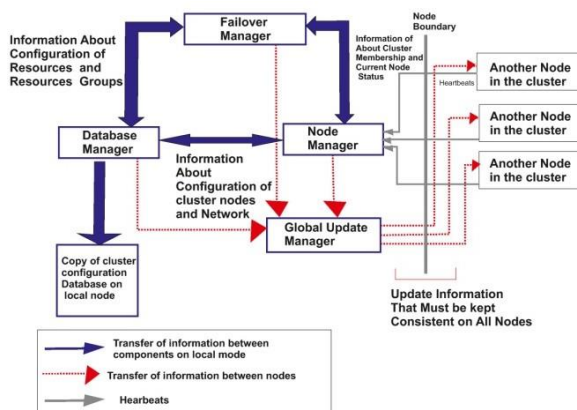
## 4.2 COMPONENTS



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

Cluster Service runs on every node of aserver cluster and controls all the servercluster operation. Multiple softwarecomponents include in the cluster servicesand they work together. These components Fig 1.6 shows the Database Manager, NodeManager, Failover Manager, ResourcesMonitors and Global Update Manager.

Here the information is communicatedbetween 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 localdisk of nodes, network and network interface in the cluster. For the regularcommunication of nodes all nodes in the cluster have the same list of functionalnodes.

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 becauseof the sending and receiving messages, and it is called as heartbeats. If the node detects that a communication failure with anothernode, 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 resourcegroups, 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 ofthe cluster have its own resource group because in the cluster, every failover manager works together and reassign theownership 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 is happens on all the nodes. If the appoint node is update locally, but the another node cannot be update, is removed from the listof 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 standbyserver; it exists when another server isfailure. These clusters provide the high availability and scalability for understand theread/write stores. Fig 1.7 shows that if one ofthe nodes is unavailable, another node takesthe role of the failure node.
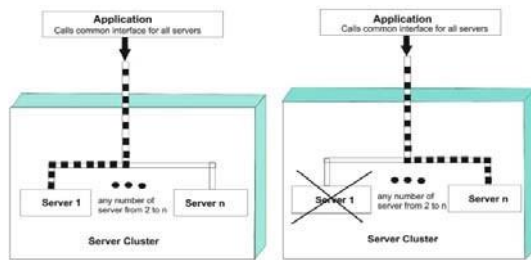
Figure 6: Asymmetric Cluster

## 5.2 Symmetric Cluster

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

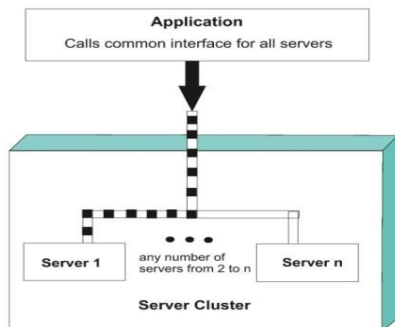This is cost effective because more cluster resources use, so in the failure condition additional load is provide.



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 theperformance 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.

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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

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

You pay the same amount for cluster server advantages as other organizations do; to satisfy their information processing needs within a specific budget, they pick either a loosely linked or a strongly connected cluster server system.

### 8. References

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[1]