A Technique to Differentiate Clustered Operating Systems

M. A. MEMON, A.K. JUMANI*, M. Y. KOONDHAR**, M. MEMON***, A. G. MEMON****

Department of Computer Science, Benazir Bhutto Shaheed University Layari, Karachi, Pakistan

Abstract: Computers groups linked together to work in parallel or in sequentially, for do task called as cluster computing. The phrase cluster is often used for high reliability and high performance, and high availability required for increase computational power more than a single system. Nowadays, the solution of making cluster computer system by using workstations to provide an attractive solutions and applications which are helpful in parallel and sequential. Today, we have the equipment's in market to build a distributed computer system but the operating system remains as an issue now for rendering the reliable system. The biggest problem is the environment, your computer to any architectural group on the scope and useful system. The design of this study and the analysis will provide an over view of the different clustered based operating systems and the best are used for run the clustered computer operating systems. In this paper we show the different Linux based and UNIX based cluster operating systems which are only design for cluster based computer system.

Keywords: LINUX OS, LINUX UNIX Difference, QNX, Cluster OS, Comparing LINUX, QNX Clusters, MOSIX

1. INTRODUCTION

In the cluster computing system, it is necessary that there is an operating system that has a Single System Image, so that in this way the user the system interacts with single computer. It is also necessary to introduce functions for fault tolerance of recovery and error, when a node fails and the work of the cluster would stop. The operating system cluster will be easy to manage, scalable and fully functional accessible (Baker, 1999). We design a cluster operating system to improve the performance of several systems for the fast output, in which we focus on the following requirements such as performance, user's need the system performance is a comparable to supercomputers. SSI that a single system image clusters would provide the powerful computational speed, in this the OS provide single system image for clusters so its look powerful computer to each end user. Ease of use, where programmer have environment where parallel applications can run concurrently, establishing the process and support the reconciliation process and to support the process coordination. High reliability, the cluster operating system may perform and manage automatically remove, add and the reorganization of the system resources easily in a centralized system (Bader, 1999).

Like any other OS, a cluster OS provide a friendly interface between user, and the cluster hardware and the applications. The clustered OS should be flexible, scalable, and reliable so it should provide the system highly available. For the high availability of cluster, the OS should a single input/output space, single migration and a single one process space (Bell, 2002). Over last two decades, scientist and researchers have construct many prototype and productions quality of cluster OS.

Distributed operating system, is like a system that will allow users to interact with (SSI) you need to single-system image or computer. Necessary and when the node fails and will deteriorate from the cluster function to perform error recovery and fault tolerance is important. The operating system must be scalable and fully functional cluster care, ensure the availability (Etsion, 2000).

We have one of the following operating system requirements, or we need to focus on a super computer system performance for the production is designed for better performance on different systems. SSI only occurs on this operating system to an image seems to be a powerful computer for the end user is set to offer. Ease of use environment those programmers who made parallel applications can beat the same time, the process of co-ordination and support to the process of personality. Automatically delete and run as high reliability, you must calculate and that system resources are in a central system restructuring is handled easily. Set the cloud computing or workstations used primarily for large companies such as operating system Windows Server 2012-2016 forecast, military bases, a Web-based Tower system, banks and for the calculation of high and complex.

Workstation and the performance of the network link in the recent evolution of the popular clusters Distributed operating system workstations. The benefit of these groups is not implemented, however, the current OS, usually spread through poor organization of resources in the

*Department of Computer Science, Shah Abdul Latif University, Khairpur Mirs Pakistan
**Information Technology Centre, Sindh Agriculture University, Tandojam, Pakistan
*** Department of computing, Indus University, Karachi
****Institute of Mathematics and Computer Science University of Sindh, Jamshoro, Sindh, Pakistan

cluster. To avoid this problem and that is that were commend that you, the traveler, the uni and multi-processor operating systems that are effective, or for clusters in the work of large processing cluster workstations for access. Nomad cluster OS some of the key features of the OS: scalability, resource efficiency controlling cluster, parallel and distributed applications, distributed I/O plans effective, error detection and recovery, security, and compatibility. Supervision activities and migration, as well as some of the mechanisms used by the nomadic recorded in the proposed system. However, you can setup and all the cluster resources to spread their knowledge strategies between the efficiency of our system. How to implement both the Central Administration and also does not use the other reports, nomads, and the operation of the system of input and output files is highly scalable and improve (Fisher, 2005). Nomad will be potentially the most effective and full implementation of the working station to the operating system, which will be a good platform for further research, is our main conclusions.

This distributed operating system plan 9 from Bell Labs "as a network infrastructure. In particular, compare the use of the standard for intermediate networks, globe, with the help of computers running the OS Plan 9. These comparisons are based on the properties of the offer in connection with the network, security, authentication, data organization and resource discovery. Clusters using hardware and software products provide for parallel processing. The main problems in the development of the cluster system are the choice of the OS that runs on all nodes. We compare three alternatives: Windows NT, Linux and QNX real time production grow Comparison based on expressive power performance and ease of use of statistics. The result is that none of these systems are clearly advantage over another in all statistics, but teach has its own advantages and disadvantages. Therefore, Select base system will contain some technical compromise, but not that great (Baker, 1999).

The group is now usually used to perform these programs are often messages go hand in hand with a run time. When the no. of nodes in the cultivation of clusters. Why create a larger, than the time before failure (MTBF) of the cluster. If you prevent are start of the program since its inception would, it is desirable that the cluster system some fault tolerance control mechanisms/ reboot offers. Another method is to insert it, in to the clusters for the OS. It is more complicated, but let me check and repair all messages that are sent to the application, regardless of the communication library (Hildebrand, 1992).

Operating system cluster Fire Phoenix (Phoenix core) is the minimum set of nodes of Cluster keys with the support of the scalability and fault tolerance. Define the elements of the system and its internal cluster operating for support of tolerance, scalability and fault in this OS. Based on the basis of the Phoenix user environment can easily be constructed according to the needs of the users. In addition, we appreciate the Phoenix from 4 different perspectives, for example, tolerant, scalability, performance, influence on scientific calculations and facilitate the creation of the user interface.

- Solaris MC

Solaris Operating System is a prototype distributed among multiple clusters. This provides a unified system images (SI). Group presented to the user and applications such as PC, TM, UNIX, and Solaris OS. It is built on top of the Solaris OS. Most of the Solaris technology provides dynamic load modules Solaris OS, and minimizes changes in the core Solaris. Such as Solaris MC Show many uses existing OS, it can extend to support cluster. Solaris offers the same MBI/MPI as Solaris, which means the driver and apply existing facilities binaries to run un-modified Solaris OS. Global file system expands so that the function of Solaris Processing on all nodes enables transparent accessing to remote devices and cluster out machine on network. Solaris supports running external process and external network transparency, accessible for any cluster node. Solaris components implemented in C++ with common that is compatible with CORBA, object oriented all new services defined system IDL language definition. Object communicate through the introduction of system that gives Solaris and out sourcing. This shows the general formulation of a high level such as C++ may use to implement combinations (Kirch, 1999).

Solaris OS design for availability. If node fails, the cluster continues to function. Working Solaris Core separately a teach node, node failure does not cause failure of the entire system. Which cannot be found automatic configuration and system services to enable other nodes. Only programs that use Sources of the failed node, depending on the failure. Solaris to create new types of faults UNIX. Solaris is a distributed cache UNIX file system semantics sequence, based on virtual source, file system architecture and memory. Solaris Spring basic idea of using the compliant CORBA Model communication mechanism, memory and virtual file architecture and use of Spring C++ as a language implementations. Solaris file global system, called a proxy file global system from (PX FS) makes scanning transparent access to the site (Mitchell, 1994). This process open a file on system, each node use the same path. Traffic jam In addition, the system keeps the semantics of the standard access file sand UNIX files can open simultaneously from different nodes. Above the original Solaris system built by changing the node interface and brand the core doesn't require amendment. Global process control system Solaris allows placement of a transparent process for the user. Threads in the same process are carried out in the same node, but all methods can be performed in each node. System designed to POSIX semantics are supported for processing, and to ensure good performance, which is always available and minimize the Solaris kernel changes. I/O sub-system Solaris allows access to all I/O nodes in the system regardless device node physically connected. Applications opens all devices in system, although local facilities. Solaris M Chas an additional device drivers can be dynamically configurable and Solaris are

loaded Configurations are common to all devices distributed server. Solaris networking sub-system provides image MC environment for network application. Entire network Connections does not correspond to any application, regardless of the applications running on the node (Morin, 2004).

This achieve a packet filter to the packet is done in corresponding node and treatment protocol for node. Network Service can play multiple nodes to provide better performance and low the latency. Multiple process are as a server for given service. The networks sub-system and select special the admission process the service request. For example, login server, Telnet, FTP and HTTPs are copied to each default Web Site. For each new connection to the service in the cluster to another node controlled depending on the load balance policy. Consequently, it may require more cluster HTTP, for example parallel to the control. Solaris provides highly availability in a variety of ways, included error detection, is the scope and purpose of reconfiguring the reconfiguration program communications services system and user level Service. Some nodes may be defined to function as a reserve node failure, the node connected to the unit, for example. Any errors are transparent to user (Pratikno, 2013).

Solaris operating system MC use the term clustered operating systems above and Chorus, OSF/1ADTNC Spring Sprite, MOS, Locus and VAX clusters. OS extended to the group while maintain compatibility with large base of existing applications. Solaris emphasis on highly availability for other OS listed above (except VAX clusters). Finally, Solaris OS is manufactured in the object oriented approach C++ and build with CORBA model object.

- MOSIX

Redundancy is a software package that extends clusters Linux1 basic functions. Increased the Linux kernel allows you to cluster size computers based on Intel processors together as a single system, similar to the System SMP (symmetric multiprocessor). Redundancy is running in the background and its operation is transparent to the user of the application. Run the user application one after another or parallel as they work on SMP. You must know where they work their process. There is a request from other user sat the moment. When you create a new process, try redundancy are the best at this moment node, where they exist. The MOSIX monitors all running processes continue to (among other things) the new process).Enhances the overall cluster performance, automatically moves the redundancy process between nodes in a cluster with unbalanced load. This can be done without changes in Linux User Interface. As you may already have existing applications, you don't need to make changes to the cluster the MOSIX Valley, Refer to a specific library. In fact, you must specify the nodes in the cluster the program is running. The MOSIX is done automatically and transparently (Pike, 1992). In this respect, works the MISOX as the paradigm of plug and forget it SMP. Many user processes in DOM node and can be created and redundancy.

Assign the processing of other pages if necessary user appears run all his estate As if they were running on a node, you must start the process. It is made up of users from one server Photos. Since redundancy in OS kernel which is complete transparent user business level Applications. Adaptive load balancing and opening the store, resource controlling algorithms are in the heart of the redundancy. In accordance with the changes in use of cluster resource which come together to increase the all performance of continuous process.

Preemptive migration algorithm (online) of the appointment of processing and distribution between nodes for processing. This ensures that the cluster uses resources. On the Dynamic balancing algorithm ensures the load is distributed in the cluster. Memory Opening of the algorithm prevents Replace hard disk, Misappropriation or host migration. There is not enough memory. The MOSIX algorithms are designed for maximum efficiency, minimum effort and Ease of use. Control redundancy is decentralized. Each node of the cluster is at the same time Masters for locally created process and server for remote processing. The advantage of this Decentralized execution of process in clusters, if a minimum of node shave been added to or remove the clusters. This great facilitates scalabilities and high availabilities of the system. Another advantage of the characteristics of redundancy is its self-regulation and monitoring algorithms. To specify speed at Nodes, monitor their load and memory available and the prices of the IP Cande/s each running processes (Ritchie, 1984). By using this data decisions on the place where my Optimized processed to isolate the redundancy. Similarly, NFS allows transparent access to file system compatible, redundancy improving transparency and provides a consistent view of the processes that are running in a cluster. Model reservation system is based on document object model (DOM) node. In this model, applies to all users Seems to be running the connection node for the user. Each new process takes place on the same page/s as the parent process. However, if possible, set a local process of resources. Redundancy of the system is configured in such a way that the registration of the user uploads a node below the threshold we invite all users to whom the process boils down to this site. If the load exceeds the threshold node in the Process migration mechanism begins to process to other nodes in the clusters. The migration is done transparent without user involvement.

MOSIX is flexibility can be used to identify the different species, and with different types of clusters of machines or the speed of the LAN. MOSIX support clusters configuration with small or large numbers of computer with a minimum of the range of costs. Small class Configurations can consist of multiple computers that are connected to Ethernet. The configuration can consist of large numbers of SMP's or SMP computers, non-high performance LAN Ethernet as a giant internet. PC clusters capability in Hebrew University, where MOSIX development based is composed of Pentium server associated with fastest internet or Ethernet LAN.

How Solaris MOSIX is built on existing software that will help you from autonomous systems for a cluster system. As say on site, you have multiple computers with Linux (local area connection) and you want use the massing less system, download and install the latest version of the MOSIX.

- GLUNIX

Modern operating systems of the workstation has unfortunately not help an effective the parallel programs in an environment with serial applications is required. Now, pooling of resources to provide best performance for sequential and parallel applications which offer the aim of our research. To achieve this goal the OS must support parallel resource planning inactive gang on the network program (CPU bandwidth, disk space or band width, disk space, network hard drive) and the migration process, you can support for fastest communication for the OS &application dynamically load balancing user levels. Our system, called GL UNIX, is built like a layer on the existing operating systems. This strategy is a provider of monitor software improvements and reduced development cost. Our work is example of their search systems of high order unless they quickly integrated new mapped systems of new services on the functions by the underlying.

GLUNIX is currently support sequential and parallel tasks interactively and batch of sequential execution. GLUNIX work is closely related to the user's shell automatically and outputs to the skeleton manually by the user to support the work of UNIX standard. GLUNIX follow the Source (currently only the CPU cycles) and performs the common language runtime is loaded. GLUNIX that most single system image implemented provides a global for each process in the entire GLUNIX cluster, which thus again the GLUNIX the status of the task of a node, and users can report jobs through each node in cluster. Run binary existing application without changes under GLUNIX. In addition there is the designation and the reservation system. Batch job you can use the system of the part, which controls luggage of batches in system. GLUNIX support the cluster node size 1 up to 330knots in theory. GLUNIX does not support control or migration since it can be existing binary transparently a user level. GLUNIX is not just Cost schedule of parallel applications or have a special support for the SMP.

The first version of source code would be GLUNIX on page during the week October20, 2005. There's hardly any difference between the GLUNIX and the RSA functional as it is today, but the objectives of the GLUNIX and the RSA differs significantly. Two of them have not active transport detection load balancing. GLUNIX have better support for parallel program and forms basis for a uniform system for the image, the process ID, the GLUNIX are valid all over the world you can kill the process of GLUNIX of for each node. The main difference however is that

GLUNIX actually the basis of advanced studies in various areas. Among them are:
1. Resource schedule for parallel applications and sequential applications.
2. Automate resources parameterized.
3. Mechanism for LSE (layering systems extensions) on top of existed operating systems.
4. Provide a (SSI) as layer on top of existed OS.
5. Fault tolerance for a Single System Image.
6. Defining the UI to a NOW.
- VAX Clusters

VAX cluster formed when sufficient number of nodes, VAX and mass storage resource available stands (Scholz, 2002). New node run and connects to clusters, and members can fail or turn off and to leave cluster. When node joins or leaves the reform in clusters would process a cluster transition. The cluster transition are manage by the connection manager. In the OS of a server cluster, each connection a Manager lists all member nodes.

The List must approved by all members. A node can belong to a cluster VAX only the same Resources (such as disk controller) cannot be divided between two groups or the integrity of the resources cannot be guaranteed. Therefore the connection manager should the distribution of the cluster in groups of two or more seeking to share the same resources.

If you want to prevent share, VMS uses a quorum of voting control. Each node in the cluster contributes to a number of voices and connection manager to dynamically calculate the total no. of votes of all members. Connection Manager one maintains the value of the dynamic College (Skousen, 1999). Transitions are made the cluster will continue to run as long as sum of these votes is equal to or greater than the quorum. He had voice of the College; the connection manager must adjust the activity of the Cluster processes. When node joins and process increase the total number of votes for the quorum resource remain. The initial value of voting and the quorum. Each node in System Manager is defined and use to determine minimum set of resource than a VAX cluster work. If you like running in a cluster, each node contains the original estimate of the quorum. However, if the nodes in the connection, the connection manager to the appreciation of the College, if necessary any (+2)/2, where V is the sum of the powers of the voice. Members of the cluster can use correctable errors in communication memories in the node intact and Allow, the OS will continue to run after error is gone. This error can be termination of circuit andcause the loss of communication. The cluster member confirmed loss of Communication with node wait a moment for a member failure to connect with. The wait is usually in about a minute clutch and sets of system administrator recovery of the interval.

If the error in the meantime is to restore the cluster. In a time when the failure of the Member States is, some of the process is to restore delays in service (Zhan, 2005). If errors in which break not closes survive away from members of the cluster and remain if there is enough votes. It is said that a node that retrieves after from the cluster was removed start the connection manager. Power communication system architecture (SCA) and the fundamental link is material

based on the OS processes that run in a VAX cluster node. OS processes which these programs on the same level as connection manager are running on 5 show in figure. These Process can be measure the data grams and block the flow of traffic for different sizes of the messages. All numbers sizes of the messages (Zhang, 2009).

All numbers are approximate because performance through various command scan vary.

Cluster operating system mostly used for cloud computing or in big firms like workstations, windows server 2012-2016, weather forecasting, military bases, network based towers, air system, banks and for high and complex calculations.

2. METHODOLOGY

In cluster Operating system, a cluster operating system consists of a set of a tightly or should be loosely connected systems that can work together to perform computation, in many aspects, as they can would be view as a single computer system. Clusters generally use for High Availabilities for high the performance and high the reliabilities to provide a more computation power than single overload computer.

The cluster OS needed for:

1. Remote Executing: Application should be mature enough to fact that a program processes runs on a start node system.
2. Balanced: The systems should be implemented as intelligent system that processed placement in internal work.
3. Compatible: The system provides the execution, and load balancing andother features are without re-linking or required advancement in an application.
4. High Performance Availabilities: When a node is deleted or fails from the cluster, the system should operate continue and did not stop.
5. Portability: The system should be easily transferable (portable) to other system architectures.

Clusters are providing and solving the parallel processing paradox, matches with funding Patterns and offer incremental growths, so hardware and software technologies make clusters to fill. The SSI gap and more promising.

Fig.1 illustrates the Cluster Middleware Model

So that Clusters based computers (Linux based clusters) can be seen everywhere in big firms and middle levels. The resources which are available in the most of the clusters and **(Fig.1)** shows the cluster middleware and high speed network switch.

Have are search in some areas such as,

1. Processing: By parallel processing, performance made a cluster operating system for providing an attractive solutions, workloads and parallel serial applications.
2. Networks: In Network, the memory which is connected with other workstations and as DRAM.
3. Software's: It uses the sets of workstation hard disks to provide scalable file storage, low cost, efficient availability, and fast effective computational power.
4. Multipath: It is used and provides the communication of collaborative networks for parallel data for transferring between the nodes.
5. High scalable: "www" servers are clusters, end web-services. Network services are also clustered base, like: Traffic server, Cluster proxies' servers, Cluster firewalls, Web applications increasing computing intensive, increasing the "scientific computing".

Computer clusters are configured and used for different computation-intensive scientific calculations and different purpose and ranging from some purpose of business needs such as web-service support. In either case, Clusters are generally used for High Availability approach for higher the performance, scientific computing, DNA findings etc.

3. RESULTS

MOSIX operating system clusters and the increase of the level of standard equipment, and the Current situation is quite different. High-performance cluster, you can build a very small budget and continue to add additional nodes as necessary. MOSIXLINUX operating system led to the adoption of large clusters. MOSIX runs on a wide variety of equipment and high quality compilers and other software, such as the implementation of MPI and parallel file systems fig.2 shows the statistic of byte sent.
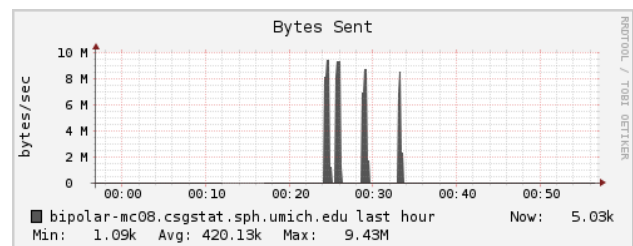

Fig.2 shows the bytes sent status

Even with redundancy, users have option to the kernel for your load balancer. MOSIX is the recognition of the preferred platform for development of HPC cluster. Programming of these systems is also easy because all the data for all processors and is not significantly different from the sequential programming. After that Fig.3 shows the received bytes.
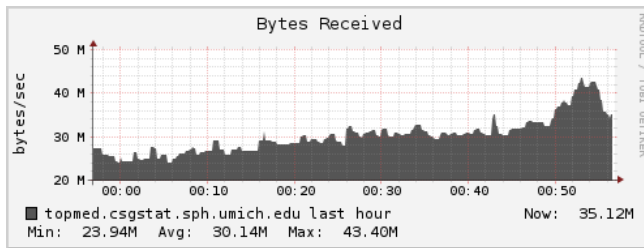
Fig.3 shows the bytes received

The MOSIX clusters that are used to run parallel programs for calculation of a lot of time and is of particular interest to the scientific community. A lot of time cost must regularly use simulation, and other applications complete in short time it is efficient in load sharing, load balancing and data simulating.

4. CONCLUSION

Cluster computing OS have been researched and developed over last some of decades. Now, it is not matter of understanding and determining what capability cluster OS requires, but rather its practical approach to implements require features which are necessary. Clusters operating systems are becoming the solution for many software applications, both parallel and sequential. We are believing that existing cluster OS's are matured enough to be used in production, and with advent of fast and fastest network technologies.

REFERENCES:

Baker, M., and R. Buyya, (1999). Cluster computing at a glance. High Performance Cluster Computing: Architectures and Systems, 1(3-47), 12.

Bader, D. A., and J. JáJá, (1999). SIMPLE: A methodology for programming high performance algorithms on clusters of symmetric multiprocessors (SMPs). Journal of Parallel and Distributed Computing, 58(1), 92-108.

Bell, G., and J. Gray, (2002). What's next in high-performance computing?. Communications of ACM, 45(2), 91-95.

Etsion, Y., and D. G. Feitelson, (2000). Time Stamp Counters Library-Measurements with Nano Seconds Resolution.

Fisher, J. A., P. Faraboschi, and C. Young, (2005). Embedded computing: a VLIW approach to architecture, compilers and tools. Elsevier.

Hildebrand, D. (1992). An Architectural Overview of QNX. In USENIX Workshop on Microkernels and Other Kernel Architectures, 113-126.

Kirch, J. (1999). Microsoft Windows NT Server 4.0 Versus UNIX. URL http://www. unix-vs-nt. org/kirch.

Mitchell, J. G., J. J. Gibbons, G. Hamilton, P. B. Kessler, Y. A. Khalidi, P. Kougiouris, and S. R. Radia, (1994). An overview of the Spring system. In Compcon Spring'94, Digest of Papers, 122-131. IEEE.

Morin, C., P. Gallard, R. Lottiaux, and G. Vallée, (2004). Towards an efficient single system image cluster operating system. Future Generation Computer Systems, 20(4), 505-521.

Pratikno, H., D. E. Reese, and G. A. Wilson, (2013). Spacing Pilots Performance Study Using Public Data in the Barnett. Unconventional Resources Technology Conference (URTEC), 790-799.

Pike, R., D. Presotto, K. Thompson, H. Trickey, and P. Winterbottom, (1992). The use of name spaces in Plan 9. In Proceedings of the 5th workshop on ACM SIGOPS European workshop: Models and paradigms for distributed systems structuring, 1-5, ACM.

Ritchie, D. M. (1984). A stream input-output system. AT&T Bell Laboratories Technical Journal, 63(8), 1897-1910.

Scholz, W. (2002). High performance Linux clusters.

Skousen, A., and D. Miller, (1999). Using a distributed single address space operating system to support modern cluster computing. In Systems Sciences, 1999. HICSS-32. Proceedings of the 32nd Annual Hawaii International Conference on, 10, IEEE.

Zhan, J., and Sun, N. (2005). Fire phoenix cluster operating system kernel and its evaluation. In Cluster Computing, 2005. IEEE International, 1-9, IEEE.

Zhang, Z. J., J. S. Pan, and Z. Q. Sun, (2009). A parallel debugger based on cluster operating system using B/S structure. In Software Engineering, 2009. WCSE'09. WRI World Congress on, 3, 148-151, IEEE.