

Improved Virtual Cluster Management System for Best Performance in Cloud Computing

**Mr. Banti Anil Kumar¹, Dr Anantula Pranayanath Reddy², Mr. Prathipati Ratna Kumar³,
Mr. Donthireddy Sudheer Reddy⁴**

¹Assistant Professor, Department of CSE, Keshav Memorial Institute of Technology, Hyderabad-500029,

²Associate Professor, School of Engineering, Malla Reddy University, Hyderabad-500100,

^{3,4}Assistant Professor, Department of CSE, Koneru Lakshmaiah Education Foundation, Hyderabad-500075. bantuanil064@gmail.com,
a.pranayanathreddy@mallareddyuniversity.ac.in, rk30111972@klh.edu.in,
sudheerreddy@klh.edu.in

Abstract

More novel techniques are introducing to the world to make user friendly environment. Technology and the population are two important concepts in front of the professionals. Technology is growing fast then world population; the dependency on the computers is also increasing. Early stages of the computer systems we had very less memory capacity and now we raised to ZBs. For any concept data plays a key role and bulk of raw data is available and this data must collect, refined, processed and validated for analysis purpose. Cloud computing is the latest buzzword along with cluster computing and management. For executing large datasets we require more memory when there is availability of raw data is in TBs to more. To execute more data we require more virtual machines which are treated as one single system and it is similar to executing on single system based on virtual cluster management system model. VCMS model manages and executes applications and run safely deploy accurate results. Cluster programs blocks can be scaled up and scaled down for more capacity occupied computer applications related to banking, business or weather forecasting and many more.

Keywords: Cluster Management System, Cluster, cloud computing, cluster computing;

Introduction

From decade of years computer technology is taking different turbulences with success and failures. Summary at the end of years are many transformations taken in various innovations of computers. Various innovations that are related to computer architecture, various OS, computer network and computer applications which are user friendly. A single CPU computer cannot solve some complex problems and unsolved queries are handled by parallel and distributed technology uses multiple systems to solve complex problems that cannot be achieved by single user. Innovations of parallel and distributed systems changed the entire technology, which helps all users located in a geographical around the globe can easily communicate. Parallel and distributed systems took the next step for technology by introducing computer clusters, computing grids and computing clouds. Example 25 or 30 computers are grouped into one cluster. One system consumes more power where is group of systems less power because the programs are equally distributed on available computers in clusters, this is called load balance not only power, memory also increases, processor also increases and network also increases. Power, processor, memory are called resources, they are managed as resources pool. Every

cloud can have resources pools. All these resource pools utilize as per the requirement of cloud. Some of the examples of cluster computing are Google search engine and weather forecasting app, they are related to distribution environment. Cluster computing should support high availability, high performance and load balancing. Cluster launched in 1990s idea of aggregating hundreds of standard machines in order to form a high power computing cluster.

Anatomy of a computer cluster

Figure 1 highlights the hierarchical structure of a cluster organized around network of interconnected equipment (switches). The machine making up a server cluster are generally of the same type. They are stacked up in racks and connected to switches. Therefore systems can evolve based on need: nodes are added and connected on demand. This type of aggregate, much cheaper than a multiprocessor server, is frequently used for parallel computations. Clients communicate with cluster as if it were a single machine. Clusters are normally made up of three or four types of nodes: computing nodes (the most numerous ' there are generally 16, 32, 64, 128 or 256 of them); storage nodes (fewer than about 10); front end nodes (one or more): there may be additional nodes dedicated to system surveillance and measurement. Nodes can be linked to each other by several networks: the computing network, Forex changes between processes and the administration and control network (loading of system images on nodes, follow up, Road measurement, etc.). To ensure large enough bandwidth during the computing phases, computing network switches generally have a lot number of ports. Each machine, in theory, has this same bandwidth for communicating with each other machines linked to the same equipment. This is called full bandwidth bisection. The computing network is characterized by very broad bandwidth and above all has very low latency. This network is a high performance network and is often based on a specific communication topology and Technology. The speeds of computing networks can reach 10 Gbit/s between each machine, and latency can be as low as a few nanoseconds. Computing clusters are used for high performance computing in digital imagery, especially for computer generated images computed in render farms. Even if server fails the administration software of the cluster is capable of transferring the tasks executed on the faulty server to the other servers in the cluster. This technology is used to information system management to increase the availability of systems. Disc forms shared linked by Storage Area Network are an example of this technology.

Literature Survey

- [1] Y Vijay Bhaskar Reddy et. al. cluster plays a key role in cloud computing and author focus on machine learning and data mining concepts. Cross breed clustering algorithm is meant for high dimensional data in datasets and focus on virtual cluster management. There are lot of drawbacks and related to the core concept.
- [2] N Sree Ram et. al. any flied now a days acquire enormous data and to analyse search data we need support of application. Proposed system is Hadoop distributed file system(HDFS) by using map reducing techniques. Partition is based on clustering algorithm using MR framework for analysing and filtering data and no focus on virtual clustering management.
- [3] Vignesh U et. al. once upon a time data mining played key role and foundation for Big Data Analytics. There are lot of failures in analysing data properly. Proposed work of this paper is focus on biological data mining techniques to predict inner relations by using concepts of cluster, classification and alignment techniques and no focus on virtual cluster management.
- [4] Balaraju.Jet. al. big data present buzzword in the world, it is related to huge memory related data and it should be processed and Stored properly. Proposed system is based on Hadoop cluster using DNA, this algorithm built Kriti system call BABA means build in authentication based on access. By using HC we can reduce operational cost, computational power, increase data security and no focus on virtual clustering management.
- [5] ShaikShafiet. al. Vehicular ad Hoc Network (VANETs) connect vehicles through wireless links and their job is to stop high speed vehicles. To achieve proposal mechanism cross-layer autonomous route recovery mechanism and new cross layer cluster based routing are engaged.

[6] Srilakshmi R. et. al. mobile Ad Hoc Network infrastructure less wireless network is managed for dual server based security protocol encryption and decryption of the based on plaster technique focus on virtual cluster management.
[7] Rajiv R Bhandari. et. al. mobility aware clustering routing algorithm (MACRON) proposed algorithm for facing two challenges. sleep schedule approach and number of cluster nodes by independently decentralizing. Micron works efficiently for both mobile and stationary network and no focus on virtual clustering management.
[8] Javanthi. E. et. al. fast growing on in computer science mobile network the purpose of using manet for authenticate and digital certificate among various nodes. Misbehaving nodes are identified hand removed from topology table. Clustering mechanism introducing here is to reduce communication and certificate revocation for secure network.
[9] T Ganesan. et. al. wireless sensor network growing field in networks. genetic algorithm the Optimisation technique used to improve efficiency of larger scale applications which warheads in communication which leads to energy dissipation. To overcome cluster lifetime maximization technique is used to minimise activity and with less energy.
[10] Srimathi V. et. al. author focuses on induced extended fuzzy clustering model (IEFCLM), the directed graph pattern with connecting matrix using cluster techniques and no focus on virtual cluster management.

Existing System

According to the cluster scenarios the clusters are permitted to data only. Latter on improvements taken place and as the technology rolling to every milestones and we are in a position to handle large databases which are not possible with old versions of cluster management. Previous cluster Technology is used to solve data related problems as technology is grow it took a transition to proposed model.

Proposed System

Cluster is fast growing field cloud computing and is used in various applications. Cloud computing and clustering are two concepts that help software professionals in completing large complex jobs. A cluster is a group or collections of servers and other resources that act like single system enable high availability and in some cases, load balancing and parallel processing. Figure 1 below five computers that are interconnected to form a virtual cluster or clustering and cluster is a single device, similarly we can have multiple clusters.



Fig 1 Five computers forming cluster

There are two types of clusters physical cluster and virtual cluster, a physical cluster a collection of servers (physical machines) interconnected by a physical network such as LAN and virtual cluster is a virtual machines that are grouped and configured for high

performance computing or parallel computing[23]. Then cluster is created, different cluster features can be used such as failover, load balancing and live migration of virtual machines across physical hosts. Load balancing means when is server and a virtual machine are running busing with each other and new task request appeared near the server and traffic is diverted to other available cluster. Live migration is the process of migrating machines whenever required for computing tasks, if any virtual machine drops out in middle of execution and executing job should easily migrate to another virtual machine. Below figure 2 shows a cloud platform with four virtual clusters and three physical clusters that means three physical machines.

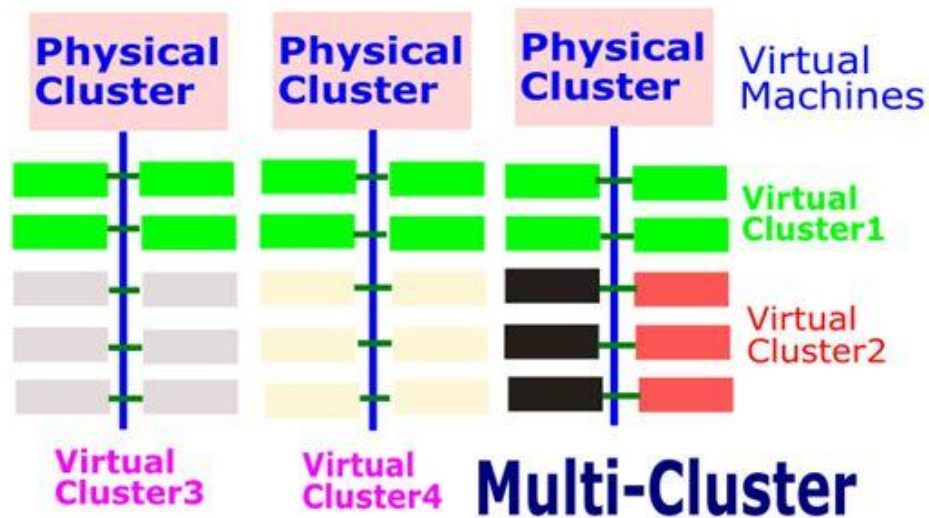


Fig 2 A Cloud Platform with four virtual clusters over three physical cluster.

Physical means which is really available and virtual clusters means which is illusion that is not physically available and we create them virtually. There are for virtual clusters virtual cluster 1, virtual cluster 2, virtual cluster 3 and virtual cluster 4 and all this clusters are individually maintained with computers which are unit interconnected together in a network. Under virtual cluster 1, twelve individual computers are connected together in network to form virtual cluster. The size (number of nodes) virtual cluster can grow or shrink dynamically, similarly to the way an overlay network varies in size in a peer-to-peer (P2P) network. The failure of any physical nodes may disable some virtual machines installed on the feeling nodes. But the failure of virtual machines will not pull down the host system. Virtual machines can be replicated in multiple servers for the purpose of promoting distributed parallelism, fault tolerance and disaster recovery.

The concept of virtual cluster is based on application partitioning similar to distributed computing in parallel processing. Different application are partition single virtual cluster management system (VCMS). VCMS are highly performance, connection oriented networks that link group of computer clusters. We can link all clusters with interconnected a VCMS. Virtual machines are placed on hardware systems, they can be sometimes normal PCS or group of commodity computers in a cloud completing. For each virtual machine contains cluster programs that are named from cluster program1, 2, 3 and 4. Virtual machine can handle all 4 cluster programs or few of the cluster programs under cluster manager (CM). Cluster manager play a key role in virtual cluster management system. The role of cluster manager is to provide environment for clusters. Cluster virtual machines are connected to cluster manager. Cluster manager can access n number of clusters based on memory availability on the cluster which is shown as common memory. Each virtual machine can have a local database her private database and common memory is said to be as public area[23] Cluster programs from one to n, run on different virtual machines. Cluster programs or virtual cluster node per

application A, B, C and D. One cluster manager can handle and number of clusters randomly on available memory according to figure . All n programs can run on each virtual machine (1:n). Load balancing achieved using load index and frequency of user logins. The automatic han scale down how the virtual cluster can be implemented based on above model. Scale up means more cluster programs based on the requirement scale down some of the computers or cluster manager cannot accommodate all clusters and some of the classes may drop down. There will be buffer cluster programs related to virtual machines, whenever there is a scale down the virtual machine are available with buffers. There are five steps to deploy a group of virtual machines on to a target cluster:
 preparing the disc image, configuring the virtual machines, using shared memories, choosing the destination nodes and executing the virtual machine deployment command on every host.

High performance virtual storage

Some storage architecture design can be applied to reduce duplicated blocks in a distributed file system of virtual clusters. Hash values are used to compare the contents of data blocks. Data blocks can be chunks soft memory divided equally or randomly based on availability of memory. Every virtual machine configured name disc image network setting allocated CPU and memory. This method is inefficient when managing a large group of cluster machines, cluster machines method is enough inefficient managing large group of cluster managers. Cluster manager with the same configuration with the same configuration could use predicted profiles to simplify the process. Live migration process of moving a running virtual machine or application which holds different cluster or a related to cluster between different physical machines without disconnecting the Client or application. Memory storage and network connectivity off the virtual machine are transferred from the original guest machine to the destination. There can be two parts memory rich private memory and the public memory where public memory can be used for executing applications. The live Migration of cluster manager allows workloads of one node to transfer to another node. However, it does not guarantee that cluster manager can randomly migrate among themselves. Live migration allows automatically optimize virtual machines within resource pools. Perform hardware maintenance without scheduling downtime or disrupting business operations. When a cluster manager fails, its role could be replaced by another cluster manager on a different node, as long as they both run with the guest OS. Cluster managers can be live migrated from one physical machine to another; in case of failure, one cluster manager can be replaced by another cluster manager. Public memory with share block device is shown in the figure 3. Shared block contains network block device may be used: FC, ICSI, AoE, GNBD, NFS-basef file, Petal etc.

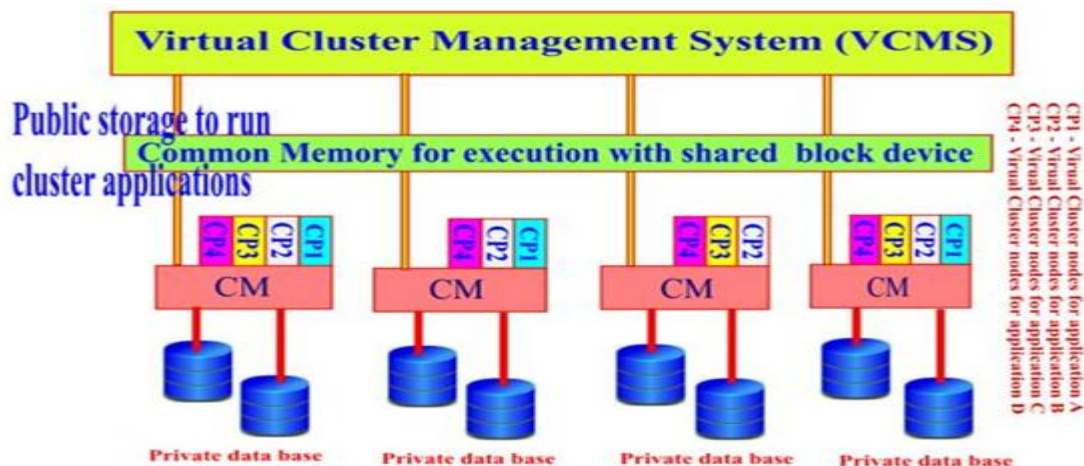


Fig 3 Virtual Cluster Management Systems (VCMS) Model

Intel Xeon scalable processor family value comparison for VCMS model is given in below table 1

Model	Family	L3 Cache	Cores	Threads	Speed	Price(Dollar)
8176	Platinum	38.50	28	56	10.4	8,719
6148	Platinum	27.50	20	40	10.4	3,072
6138	Gold	27.50	20	40	10.4	2,946
6126	Gold	19.25	24	12	10.4	1,776

Table 1 Scalable Processor value analysis

Implementation

Python is the best high level language for complex problems. There are three main applications of python, they are web development, machine learning, data analysis/ visualization, scripting, game development, desktop applications, embedded system applications, cloud Technology, cluster management system called to be cluster computing , block chain Technology and analysis of biomedical signals [21][22]. Cloud computing scalability is with less amount and it very easy scale up and down, server storage where is simple we can adopt cloud server from other sources with less amount, data security in cloud computing very using and security is monitored by protocol and data loss is also very low because of cluster management system. Where virtual machines are converted to single cluster and implementation point of view python suits better for virtual cluster management system model and python code is shown in below figure 4.

```
In [ ]: import math
import random
import time

def sample(num_samples):
    num_inside = 0
    for _ in range(num_samples):
        x, y = random.uniform(-1, 1), random.uniform(-1, 1)
        if math.hypot(x, y) <= 1:
            num_inside += 1
    return num_inside

def approximate_pi_distributed(num_samples):
    from ray.util.multiprocessing.pool import Pool # NOTE: Only the import statement is changed.
    pool = Pool()

    start = time.time()
    num_inside = 0
```

Fig 4 Python code

Test Results

Multiprocessing pool is referred to a single machine to a cluster in cloud computing which is given in figure 5. Comparing the scalability of three Python implementations of Monte Carlo Pi estimation — in a single-process, parallel on a single AWS m4.4xlarge instance using multiprocessing. Pool, and distributed on a 10-node cluster of AWS m4.4xlarge instances using Ray. Going from one node to a cluster using Ray only required changing a single import statement and scales the throughput of the application by an order of magnitude. Call the

program five times with num samples values 1,000, 10,000, 100,000, 1,000,000 is given in table 2 based on Monte Carlo method.

Num_samples = 1,000	Num samples = 10,000	Num samples = 100,000	Num samples = 1,000,000
3.136	3.1768	3.1344	3.1414
3.136	3.1496	3.1359	3.1412
3.04	3.1644	3.1426	3.1423
3.136	3.1504	3.1412	3.1442
3.136	3.1384	3.1443	3.1417

Table 2 Monte Carlo method.

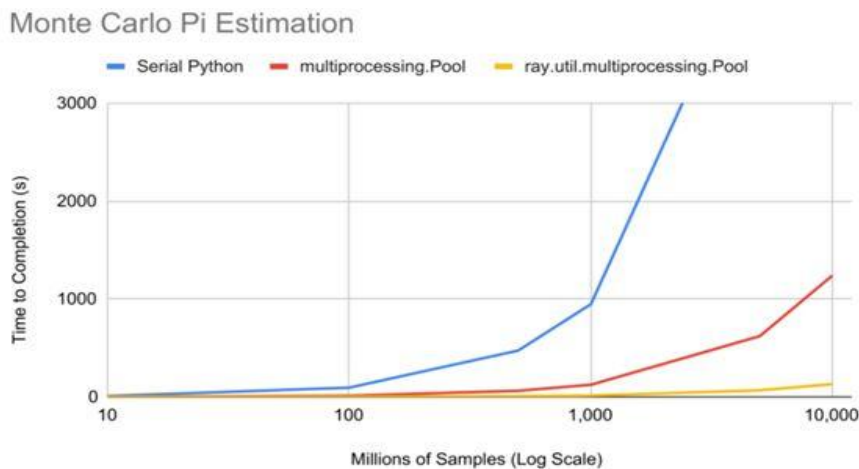


Fig 5 Monte Carlo Pi Estimation

Conclusion

There are lot of drawbacks in cluster management process they can be overcome by little exercise applied to Technology. Cloud computing is fast growing field Technology. Previously professionals used to face problems in executing huge SLoC, with new technology we can execute huge SLoC by VCMS model. Virtual Cluster Management System model is meant to execute large programs with large dataset within single system execution time. The maintenance cost cloud is less than on-premises. By using cloud computing any organization can maintain VCMS with less maintenance cost by add-ons like good server maintenance and data protection.

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