CLUSTER COMPUTING VS CLOUD COMPUTING A COMPARISON AND AN OVERVIEW

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***ABSTRACT**: In the field of Information technology cloud computing appears as one of the demanding, result oriented and latest topics. Here it is stated that cloud computing is based on several areas of computer science research, such as virtualization, HPC, grid computing and utility computing. One method of computer is called cloud computing, which shares the majority of the Internetwork computer resources instead of via software or storage on local computers. To distribute their work in many rooms and then run these separate parts simultaneously in a computer group is a method to create an application run more rapidly. Cluster computing is the move toward that has been applied with applications of technical and scientific standpoint. In this article, we have done everything possible to judge against and distinguish with cluster and cloud computing from multiple points of view and to facilitate understanding of the important features of both.*

Keywords: Computing models, deployment models, HPC cluster, cluster computing, cloud computing, comparison, Google trends.

INTRODUCTION

Grid computing and cloud computing are relatively two fresh thoughts inside the computing field. Cloud computing is clearly defined here; "A large-scale model of distributed computing that is driven by the scale of markets, in which an abstract power dynamic evolutionary group well-managed computing, virtualization, storage, platforms, and drive service area provided on request of external users on the Internet Given that cluster computing is often described as "computer cluster may be a group of computers working together in many ways they are a team". Modules of a cluster region element linked with one any more during speedy local space networks [1]. The superior computing (HPC) once limited to institutions that could afford supercomputers knowingly gained strength and time spent. There was a need for small scale HPC, low value which results in computer cluster. The appeal of the web and also the powerful technologies availableness and speedy network technologies has altered the way of use [2]. In this article, we will focus taking place the beginning of the cluster and cloud and analyze a similarity among them.

CLOUD COMPUTING

Cloud computing is a technology to facilitate uses the Internetwork and middle distant resources to support information and applications. Cloud computing permits clients to use the applications, but do not have Internet on their computers. This technology conveys well-organized computing by merging storage, memory, process, and information measure. Cloud computing can be a calculation model that has emerged around the arrival of 2007 [3]. Computing resource pool provides IT users will get through the web. The easy standard of cloud computing is to move the computing from the native laptop into the network [2]. This constructs the resource containing the network, servers, storage, applications, services and needs without significant investment on its implementation, purchasing and maintenance. Resources on demand without prior reservation needed and therefore eliminate the supply and progress resource utilization. A cloud can be a mixture of distributed and parallel system that includes a rest of virtualized and organized computers, and these are provisioned dynamically and a set or a large number of existing computing resources created the attached device level service [4]. Cloud computing is more ideas of object-oriented programming abstraction. Abstraction, as reported above, rule specifies the advanced operating visibility. All that is visible is the associate that accepts inputs and provides outputs interface. However, these results are calculated is completely hidden. For example, an automobile driver is aware that a direction to return the car in the direction they need to go, or stepping on the accelerator can make the car accelerate.

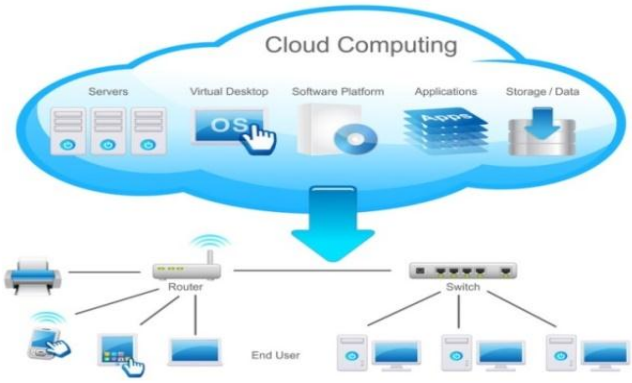

Figure 1: Cloud computing

The driving force is normally quiet, however, on the instruction of the management and therefore the accelerator results in the movement of the car. Therefore, these data are overlooked the driving force. A cloud computing is similar; the concept of abstraction is applied in an environment of extremely hiding the actual physical computing a user process. In a large cloud computing, the information will be on multiple servers, the details of the network connections are hidden and therefore the user does not understand. In fact, cloud computing is the name of a cloud is usually want to describe internal parts of inaccurate data [5].

COMPUTING MODELS

Cloud providers offer services that are classified into 3 categories [6].

Software as a Service (SaaS):

SaaS is a replica in which an application is offered as service to consumers using the Internetwork. A single case of service

works in the cloud and multiple end users services. Thus SaaS eliminates client fears on storage, server applications, application development, and related common concerns of IT.

Platform as a service (Paas):

This replica brings a development atmosphere provided as a service, and these advanced levels of alternative service can be designed by end-users. In alternative terminology, PaaS offers virtualized servers that multiple users work on applications or grow innovative applications, with no having to concern about keeping operating systems, server hardware, equalization or weight power calculation.

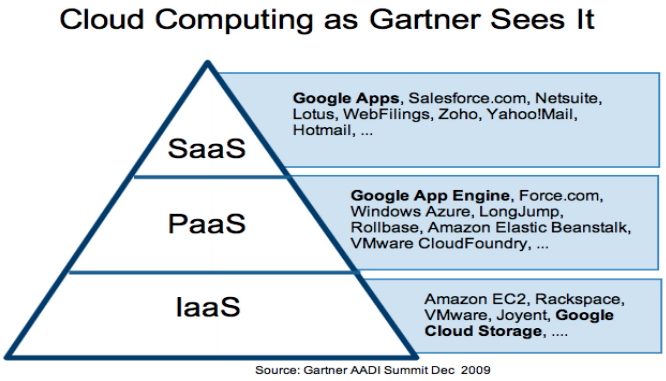

Figure 2: Cloud computing Models

Infrastructure as a Service (Iaas):

It is mentioned as a cloud of resources that provide resources to users produce better quality talents virtualization. Therefore, IaaS provides the basic functionality of storage and computing as service consisting in network servers, storage systems, network instrumentality, information headquarters, etc. are basic samples thereof.

DEPLOYMENT MODELS

The cloud is not just a technology. There are many approaches to assemble the services that connect the installation of servers and virtualization technologies IT, computer servers are combined into giant pools and split individual servers in different virtual machines. There are a number of dissimilar implementation models for the application of technology in the cloud. Each has disadvantages and advantages [7, 8].

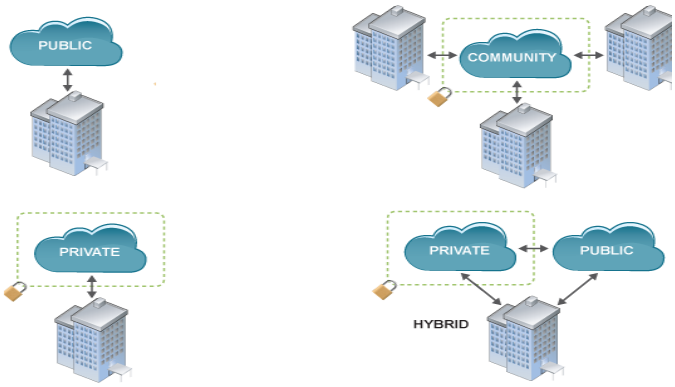

Figure 3: Cloud Models

Public Cloud

Public Cloud permits services and systems to be easily available to general public. The Information Technology monsters such as Microsoft, Google, and Amazon recommend cloud services via Internet [12]. The public cloud model is IBM Blue Cloud.

Private Cloud

It allocates systems and services to be easy to get to within organization. The Private Cloud is managed simply inside a particular organization. However, it may be directed internally by the organization itself or third party [14, 15].

Community Cloud

A community cloud infrastructure is shared by a number of organizations that follow a particular community.

Hybrid Cloud

A hybrid cloud contains two or many clouds (public, private, or community) with a many of every one service hosted internally and externally.

CHARACTERISTICS OF CLOUD COMPUTING

The most important features of the cloud computing explains as follows [11]:

Table 1: Benefits and downsides of Cloud Computing.

Disadvantages	Advantages
Security in the Cloud	Almost Unlimited Storage
Technical Issues	Quick Development
Non-Interoperability	Cost Efficient
Dependency and vendor lock-in	Automatic Software Integration
Internet Required	Shared Resources
Less Reliability	Easy Access to Information
Less management	Mobility
Raised Vulnerability	Better Hardware Management
Prone to Attack	Backup and Recovery

1. Measured Service
2. Rapid Elasticity
3. Broad Network Access
4. Resource Pooling
5. On Demand Self Service

CLOUD STATISTICS

Here are some statistics regarding computing "As the population against the discussion of hybrid cloud of respondent's four hundredths deploying public clouds and three hundred and sixty-five days highlighted many hybrid approach." ~North Bridge Venture Partners, June 2012

"57% of corporations determine scalability because the #1 and business lightsomeness because the #2 most significant reasons for adopting the cloud." ~North Bridge Venture Partners, June 2012 "In 2012, according to Amazon thirty distinctive cloud services since its launch Amazon Elastic Cipher Cloud (Amazon EC2)." ~Giga OM professional, Sep 2012 "In 2016, three hundred and sixty five Content Days buyer will take place inside the cloud. In year 2011, he was all alone seven elements." ~Gartner, June 2012 [9]

CLUSTER COMPUTING

A cluster computer is a type of distributed or parallel processing system, which consists of a collection of interconnected individual computers running jointly as a single integrated source. The parts of a cluster are

interconnected by high speed Local Area Network (LAN) [13]. A cluster is a group of distributed and parallel computers that are interconnected by speedy networks such as Myrinet, Infini band, and Gigabit Ethernet. They effort jointly in performing intensive tasks to large volumes of data and the calculations of which would not be possible on a single computer. The clusters are mostly used in favor of load-balancing, high availability and for computing use. Cluster can also be used for high-end availability because they sustain the nodes that are used to make available service as system apparatus expire. System performance is enhanced here because still if a node expires there is one more standby node that will perform the job further and removes single points of breakdown with no any interference [2]. When several computers are connected jointly in a cluster, they share the burden of computational work as a single effective computer. Points of view of the user, which are many machines function as an essential machine. User requests received and distributed to form a cluster of all separate computers. This result in impartial computational job among dissimilar machinery is improving the performance of the cluster systems. Often clusters are used mostly in favor of computational principles, than hold IO-based behavior.

Categories of Clusters

Cluster computing is classified according to the following categories [1].

1. High Performance Computing Cluster
2. High Availability Cluster
3. Load balancing Cluster

HPC Cluster

HPC clusters are used for growing performance by distributing computing tasks on different nodes. Basically, it is used in technical computing. Popular executions are running HPC cluster nodes with UNIX flavor operating system & open source software to put into practice the parallel code.

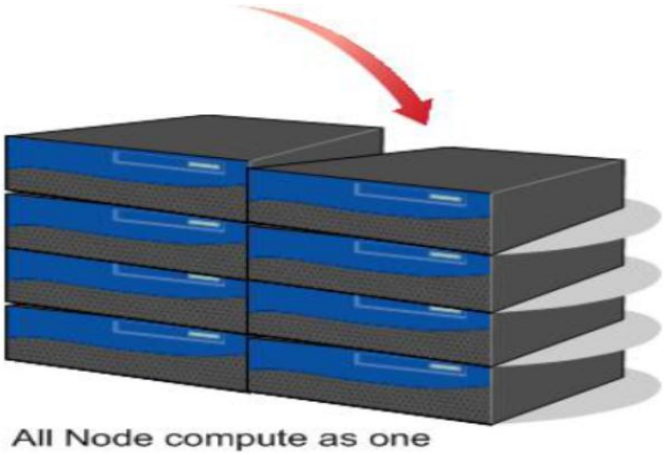

Figure 4: HPC Cluster

The native programming software manages the nodes in the cluster load balancing. Middleware as Message Passing Interface (MPI) or Parallel Virtual Machine (PVM) allows cluster development programs to be handy computing for a broad diversity of clusters.

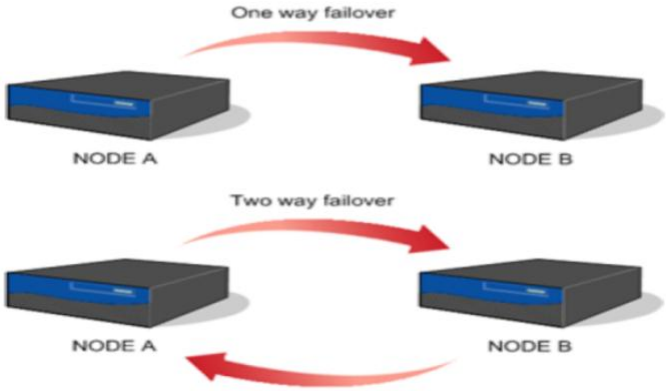

Figure 5: High Availability Clusters

High Availability Clusters

A cluster that connects primarily to increase the service availability that provides cluster. They operate by having unnecessary nodes in case of node failure waiting start work. High availability cluster types are: one way & two ways. It is used for vital business applications, network file sharing, and databases.

Load Balancing Cluster

Several computers are connected together to share the allocation of computing. Logically, they are more computers, but serves as a single essential computer.

CLUSTER COMPUTING CHARACTERISTICS

Important features of cluster computing enlighten of the following [12]:

1. Single system image
2. Centralized Job management & planning system
3. Tightly coupled systems

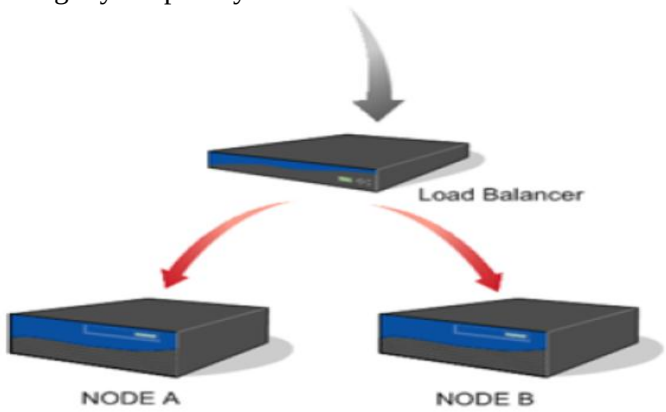

Figure 6: Load balancing Clusters

Table 2: Benefits and drawbacks of Cluster Computing

Disadvantages	Advantages
Easily accessed and applied to secret data	Improves networks Technology
Difficult for developing software for distributed systems	High availability
Programmability issues	Reduce Cost
Difficult to handle by a layman	Single system image
Problem in finding fault	Manageability

COMPARISON

Observed in a very intense way, the cluster of ideas and the cloud seems to have similar options. This phase brings light to distinguish at various angles and provide a thorough comparison of end to end. It can be understood simply once in an extremely schematic tabular state [2] as shown in Table three. These technologies will be exposed by exploring the amount of the keywords in search engines to widespread fashion. Google has this kind of instrument through its "Google Trends". With this tool, we are capable to evaluate the terms of dissimilar research completely not in favor of each other and yet watch the size of the browser differs in moment.

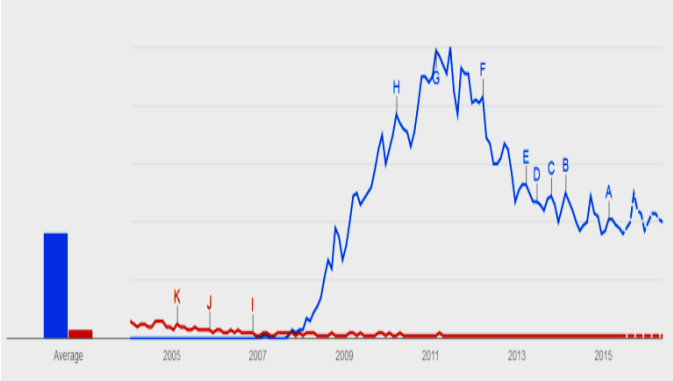

Figure 7: Cluster and Cloud computing Google trends

The Google styles presented in Fig. 7. Blue color, it is "Cloud "and red color represent "Cluster Computing" [11].

Table 3: Comparison Cloud and Cluster Computing

	Cloud	Cluster
On demand self service	Yes	No
Allocation	Both	Centralized
Resource handling	Both	Centralized
Loose coupling	Yes	No
Protocol/API	SOAP, TCP/IPREST,AJAX	MPI, Parallel Virtual
Reliability	Full	No
Protection	No	Yes
User friendly	Yes	No
Virtualization	Yes	Half
Interoperability	Half	Yes
Standardized	No	Yes
Business Model	Yes	No
Task Size	Small & Medium	Single large
SOA	Yes	No
Measured Service	Yes	No
Rapid Elasticity	Yes	No
Resource Pooling	Yes	Yes
Broad Network Access	Yes	Yes
System Performance	Improves	Improves
Computation Service	On demand	Computing
Heterogeneity	Yes	No
Scalable	Yes	No
Inexpensive	Yes	No
Data Locality Exploited	Yes	No
Software Application	HPC, HTC	SME interactive apps
Switching Cost	High	Low
VAS	Yes	No

CONCLUSION

In this article, we try our best to discuss a detailed comparison of the two models of computation, cluster and cloud computing. We tend to calculate presently able to point out a comprehensive comparison this way, this will guides the two group of peoples to meet, share and raise technology and infrastructure within and across cloud computing. This could speed up cloud computing models preliminary invention systems. While the current cluster computing maintain a wider variety of applications; it has suit much useful. As a result of the cluster currently have an extension of Figure nodes, as well as local email servers, workstations, and cases of clouds, so IT division has suit more available. Cloud computing is a latest expression for a previous vision of computing as a utility. Whereas cloud computing is the utilities of universal access, distributed computing, and fixed broadband Internet is the solution to the achievement of distributed cloud computing progress assist to its full possible components. In accumulation, improved portability, interoperability, and standardization among the distributed components of cloud computing to its full potential will assist to progress. Cloud has checked all circumstances. Therefore, there is a great opportunity for any study in these parts.

REFERENCES

[1] Cluster, Grid, Cloud –Concepts "Kalaiselvan.K" http://garudaindia.in/html/pdf/ggoa_2011/Day%201/cluster_grid_cloud_concepts.pdf

[2] Sadashiv, Naidila, and SM Dilip Kumar. "Cluster, grid and cloud computing: A detailed comparison." In *Computer Science & Education (ICCSE), 2011 6th International Conference on*, pp. 477-482. IEEE, 2011.

[3] Wang, Lizhe, Gregor Von Laszewski, Andrew Younge, Xi He, Marcel Kunze, Jie Tao, and Cheng Fu. "Cloud computing: a perspective study." *New Generation Computing* 28, no. 2 (2010): 137-146.

[4] Buyya, Rajkumar, Chee Shin Yeo, Srikumar Venugopal, James Broberg, and Ivona Brandic. "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility." *Future Generation computer systems* 25, no. 6 (2009): 599-616. [5] T OGRAPH, B., and Y. RICHARD MORGENS. "Cloud computing."*Communications of the ACM* 51, no. 7 (2008). [6] Final Version of NIST Cloud Computing Definition Published, http://www.nist.gov/itl/csd/cloud-102511.cfm

[7] "Cloud computing deployment models" http://cloud.cio.gov/topics/cloud-computing-deployment-models

[8] "Cloud computing Types" http://www.conres.com/cloud-computing-deployment-models

[9] "Key cloud findings" http://www.conres.com/cloud-statistics

[10] "Google Trends" https://www.google.com/trends/

[11] Kumar, Rakesh, and Shilpi Charu. "Comparison between Cloud Computing, Grid Computing, Cluster Computing and Virtualization." *International Journal of Modern Computer Science and Applications* 3, no. 1: 42-47.

[12] "Cloud Computing" https://www.tutorialspoint.com/cloud computing/

[13] Chung, David H. "Method and apparatus for directing data packets in a local area network device having a plurality of ports interconnected by a high-speed communication bus." U.S. Patent 5,764,895, issued June 9, 1998.

[14] Subashini, Subashini, and Veeraruna Kavitha. "A survey on security issues in service delivery models of cloud computing." *Journal of network and computer applications* 34, no. 1 (2011): 1-11.

[15] Zhang, Qi, Lu Cheng, and Raouf Boutaba. "Cloud computing: state-of-the-art and research challenges." *Journal of internet services and applications* 1, no. 1 (2010): 7-18.