RESEARCH ARTICLE

A COMPARATIVE STUDY OF GRID AND CLOUD COMPUTING

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ARTICLE INFO	ABSTRACT
	The Cloud computing is the development of parallel Computing, Distributed Computing and Grid Computing. The Cloud Computing is not a very new concept because it is connected to Grid Computing Paradigm, whose concept came into thirteen years ago. Cloud computing is not only related to grid computing but also related to utility and cluster computing. Cloud computing is computing platform for sharing resources which include software's, business process, infrastructure and applications. It is also relies on technology of virtualization. In this paper, we will discuss about grid and cloud computing and how cloud computing is different from other. In this paper, we will also highlight the future of computing as cloud computing. Also to find the actuality of the fifth generation computing in the form of Cloud Computing.

INTRODUCTION

In olden days, there was time shared computing system (Robert, 2009). Grid computing is a processor architecture that associates computer resources from various areas to reach an objective. In grid computing, an individual, computer can connect with network of computer that can perform the task together, thus working as a Super Processor (Devika Rani Dhivya, 2015). The idea of cloud computing is to come to existence to reduce the cost of computing, to increase reliability and increase flexibility by transforming computers (Ian Foster, 2018). Technically speaking, grid computing enables the virtualization of the distributed computing and data resources i.e. processing, network bandwidth and storage capacity to create a single system image, granting users and applications access to vast information technology(IT) capabilities (Rahul Kumar, 2013).

Grid Computing: It is a combination of computer resources which is from multiple administrative domains applied to common task. It is a type of parallel and distributed systems that enable the sharing, selection, aggregation of geographically distributed autonomous resources at runtime which is depending on their availability, capability, performance, cost and user-quality-of-service requirements (Future generation Computer Systems, 2009).

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It is shared collection of reliable and unreliable resources. It is a collection of servers that are clustered together. Grid computing is all about sharing, aggregating, hosting and offering service across the world (Indu Gandotra, 2011). The concept of Grid Computing will get cleared from Fig. 1.
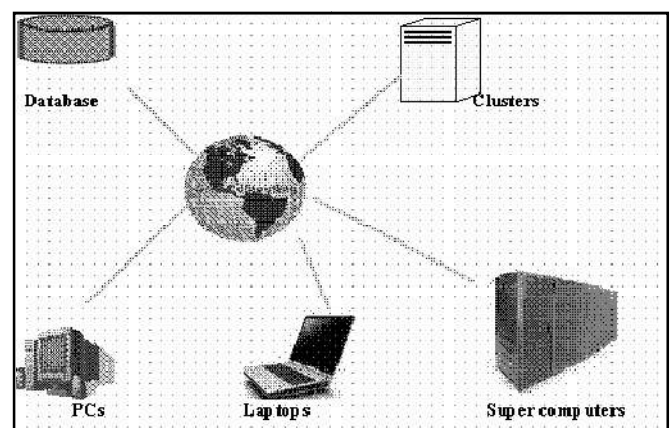

Fig. 1. Grid Computing

Grid Computing Architecture: Grid targeted on integrating existing resources with their hardware, operating system, local resource management and security infrastructure. Grids define and provide a set of std. protocols, middleware toolkits and services built on top of these protocols. Grid provides protocols and services at five different layers as identified in Grid protocols architecture (Devika Rani Dhivya, 2015).
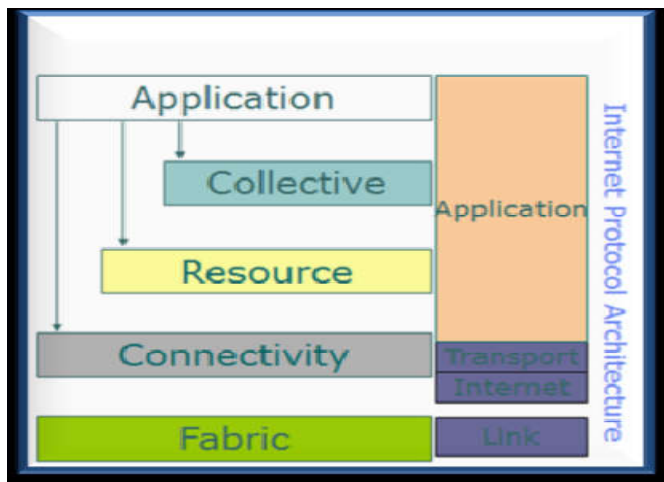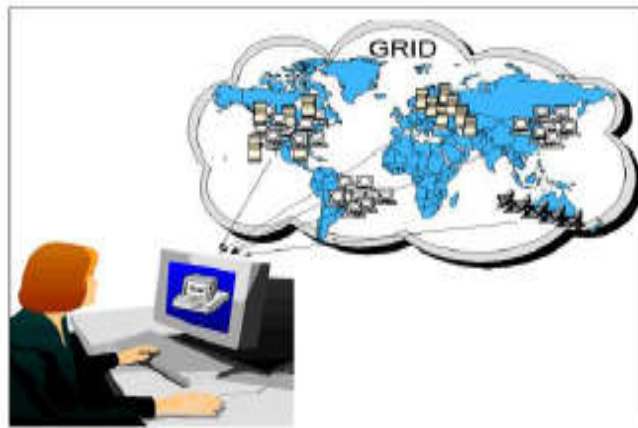
Fig. 2. Architecture of Grid Computing

Fig. 3. Grid computing concept

The above fig. shows the general concept of grid computing which shows that various resources are segregated from across the globe or geographically dispersed locations towards a central location i.e. Grid system.

Types of Grid Computing

Different types of Grids in Grid Computing

- Data Grid
- Computational Grid

Data grid is a grid computing system that deals with the controlled sharing and management of distributed data

- Storage Resource Broker (SRB)
- Computational Grid is a Grid computing system that is concerned with the computation

Applications

A. Advantages of Grid Computing (Grid Computing)

- **Access to Additional Resources:** In addition to CPU and other storage resources, a grid can also provide other resources as well.
- **Resource Balancing:** A grid incorporates large number of systems into a single system image. For applications that are grid enabled, grid performs the resource balancing by scheduling grid jobs on machines that are showing low utilization.
- **Reliability:** The systems in grid are cheap and geographically dispersed. If, for example, there is power or cooling failure at one site, then that will not affect the other site, thus high reliability will be there specially in case of real time systems.

B. Disadvantages of Grid Computing (Grid Computing)

- **Not Stable:** Grid software and standards are not stable in comparison to other computing. Its standards are still evolving.
- **High Internet Connection Required:** Gathering and assembling various resources from geographically dispersed sites require high internet connection which results in high monetary cost.
- **Different Administrator Domains:** Sometimes political issues arise when sharing resources among different domains. Some additional tools are required for having proper syncing and managing among different environment.

Cloud Computing

The main idea behind cloud computing is to make applications available on flexible execution environments located in Internet (Indu Gandotra, 2011). It is a complete new technology. It is the development of parallel computing, distributed computing, and grid computing. It is the combination and evolution of virtualization, utility computing, Software – as –a-Service(SaaS), Infracture-as-a-Service(IaaS), Platform-as-a-Service(PaaS) and Data-as-a-Service(DaaS) (Santosh Kumar, 2012). "Cloud is a Parallel and Distributed computing system of a collection of inter-connected and virtualized computer based on service level agreements (SLA).
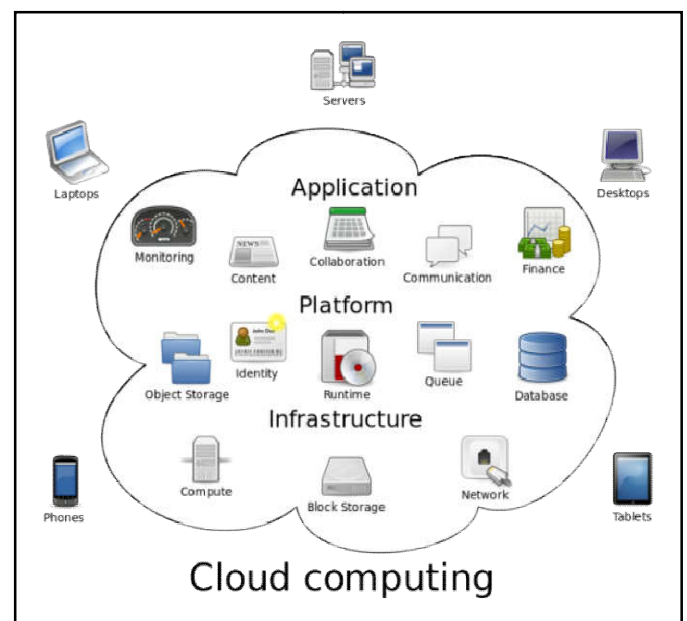

Fig. 4. Cloud Computing

Forrester defines cloud computing as

"A pool of abstracted, highly scalable, and managed compute infrastructure capable of hosting end-customer applications and billed by consumption."
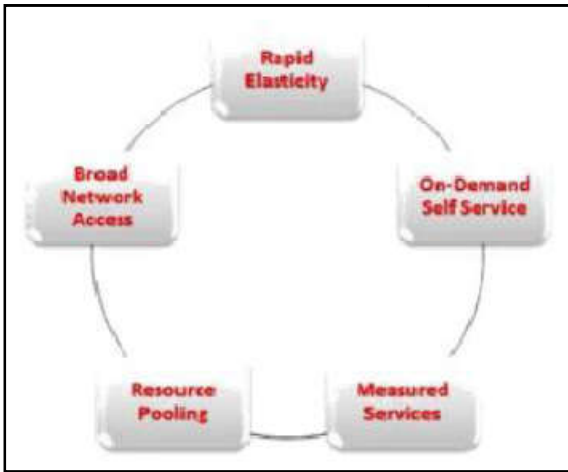
Fig. 5. Five features of Cloud Computing

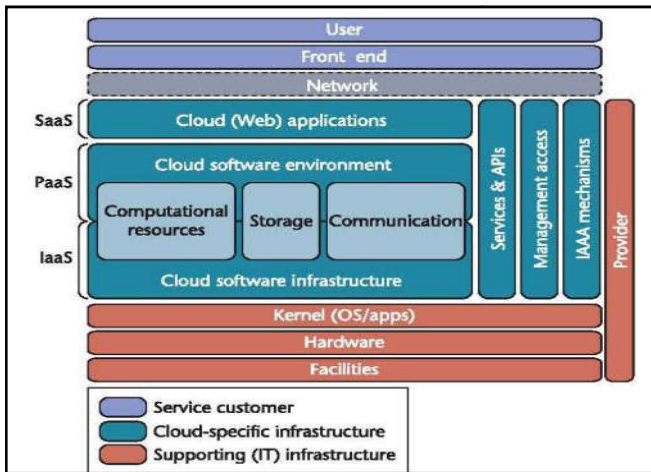## Cloud Computing architecture

Fig. 6. The Cloud reference architecture

The Fig. 6 shows a cloud reference architecture (Santosh Kumar, 2012), that makes the most important security cloud components explicit and provides an abstract overview of cloud computing for security issue analysis.

The services (http//www.Dolcera.com/wiki/ondex.php? title=cloud_computing#cloud_computing_comparison_of_diff erent_vendors) provided by cloud provides are –

- SaaS – Software as a Service Network-hosted application. (By Google Apps, Salesforce.com)
- DaaS – Data as a Service Customer queries against provider's database. (By Google Big Table, Amazon simple DB)
- PaaS– Platform as a Service Network – hosted software development platform. (By Windows Azure, Google App Engine)
- IaaS – Infrastructure as a Service Provider hosts customer VMs or provides network storage. (By Amazon web service EC2, Gogrid, Rackspace)
- IPMaaS – Identity and Policy Management as a Service Provider manages identity and/or access control policy for customer (By Rightscale, Appistry)
- NaaS – Network as a Service Provider offers virtualized networks (e.g.VPNs)

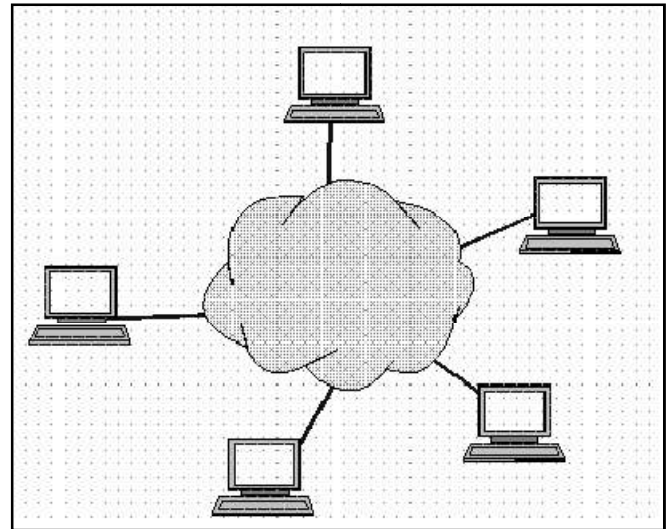The concept of Cloud Computing will get cleared from Gig. 7.

Fig. 7. Cloud Computing

Cloud Computing Types
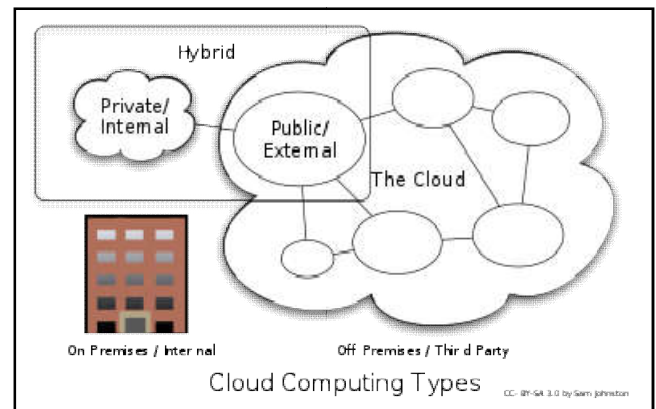
Public, Private and Hybrid Cloud

Fig. 8. Cloud computing Types

Public Cloud

Public clouds are owned and operated by third parties; they deliver better economies of scale to customers, as the infrastructure costs are spread among a mix of users, giving each individual client an attractive low-cost, "Pay-as-you-go" model. One of the advantages of a Public cloud is that they may be larger than an enterprises cloud, thus providing the ability to scale seamlessly, on demand.

Private Cloud

Private clouds are built exclusively for a single enterprise. They aim of Private Cloud is to address concerns on data security.

There are two variations to a private cloud:

- **On-premise Private Cloud:** also known as internal clouds are hosted within one own data center.
- **Externally hosted Private Cloud:** This type of private cloud is hosted externally with a cloud provider.

Comparism between Grid and Cloud Computing:

Grid Computing	Cloud Computing
Cha. Of Grid Computing • Loosely coupled (Decentralization) • Diversity and Dynamism • Distributed Job Management and scheduling(http;//www.jatit.org/research/introduction_grid_computing.html)	Cha. Of Cloud Computing • Dynamic computing infrastructure • It service-centric approach • Self-service based usage model • Minimally or self-manged platform • Consumption-based billing
In grid computing, the computers do not have to be in the same physical location 7 can be operated in dependently. As far as other computers are concerned each computer on the grid is a distinct computer.	In cloud computing, the computers need not to be in the same physical location.
The computers that are part of a grid can run different operating systems and have different hardware.	The memory, storage device 7 network communications are manged by the operating system of the basic physical cloud units. Open source software like LINUX can support the basic physical unit management and virtualization computing. Clouds are mainly distributed over MAN.
Grid is inherently distributed by its nature over a LAN, WAN. Areas of Grid Computing(http://www.jatit.org/research/introduction_grid_computing.html) • Predictive Modeling and Simulations • Engineering Design and Automation. • Energy Resources Exploration • Medical, Militry and Basic Research Visualization	Areas of Cloud Computing • Banking • Insurance • Weather Forecasting • Space Exploration • Software as a service • Platform as a service • Infrastructure as a service • Data as a service
Any Std. OS(dominated by Unix) Benefits of Grid Computing (Shruti, 2013) • Exploiting underutilized resources • Parallel CPU capacity • Virtual organization for collaboration and virtual resources • Access to additional resources • Reliability • Management	A hypervisor(VM) on which multiple Oss run Benefits of Cloud Computing (Usha Albuquerque, 2017) • Flexibility • Disaster recovery • Automatic Software updates • Free capital-expenditure • Work from anywhere • Document control • Security

Hybrid Cloud

Hybrid Clouds combine both public and private cloud models. The Hybrid cloud environment is capable of providing on-demand, externally provisioned scale.

Advantages of Cloud Computing

Shared Resources: It shares resources to provide the services to multiple users.

- **Pay-As-You-Go:** Users only need to pay those resources which are used by them. They can demand for more resources if they required.
- **Better Hardware Management:** It is easy for cloud service provider (CSP) (provider.techtarget.com/definition/cloud-provider.) to manage the hardware easily because all computers run the same hardware.

Applications of Cloud Computing

Following are some applications of cloud computing (Zhang, 2010)

- Cloud computing provides dependable and secure data storage center.
- Cloud computing can realize data sharing between different equipments.
- The cloud provides nearly infinite possibility for users to use the internet.
- Cloud computing does not need high quality equipment for the user and it is easy to use.

Benefits of Cloud Computing

The cloud computing is the next big future in computing. It has many benefits like better hardware management.

It also provides better and easier management of data, because all data is located on central server so that administrator can control who have access to files (Indu Gandotra, 2011). It also reduces runtime and response time, minimizing the purchasing and deployment of physical infrastructure.

Conclusion

Cloud computing is a new technology of computer network, providing the web services at lower comparing to normal techniques. It contribute to improve the service in other related technologies like

Grid Computing, Cluster Computing
Utility Computing / Automatic Computing
Distributed Computing

Cloud computing is growing part of IT. It has the potential to become a favorite in promoting a secure, virtual and economically viable IT solution in the future. EUCALYPTUS is an open source software framework for cloud computing.
In this way we can say, that fifth generation of the Computing in the form of Cloud Computing has been already started.

REFERENCES

"Article on Grid computing Architecture and Benefits", Ms. K. Devika Rani Dhivya, Mrs. C. Sunitha, International Research Journal of Engineering and Technology, Vol 2, Issue 9, Dec. 2015. ISSN 2395-0056,

Ian Foster, C. Yong Zhao, Ioan Raicu, Shiyong Lu. Loud 2008. "Computing and Grid Computing 360 Degrees Compared"

Rahul Kumar, I.A. Khan and V.D. Gupta, " Literature review on Grid Computing", Vol. 6(7), pp. 144-148, July 2013.

DOI: 10.5897/ AJMCSR 11.154. ISSN: 2006-9731© 2013 Academic Journals.

Future generation Computer Systems 25(2009)599-616. The university of MelBourne, Austrila.

Indu Gandotra, Pawanesh Abrol, Pooja Gupta, Rohit Uppal and Sandeep Singh " Cloud Computing over Cluster, Grid Computing: a Comparative Analysis" , Journal of Grid and Distributed Computing Vol. 1, issue 1, 2011. Pp-01-04.

Shruti N. Pardeshi, Chitra Patil, Snehal Dhumale, " Grid computing architecture and Benefits", International Journal of Scientific and Research Publications, Vol. 3, issue 8, August 2013, ISSN 2250-3153.

By Sunil Shankar "Grid Computing"

http"//en.wikipedia org/wiki/grid_computing

"Brief history of Grid computing", www.dcc.fc.up.py/ ines/aulas.1112/CG/intro2-history

Santosh Kumar and R.H. Goudar, "Cloud Computing-Research Issues, Challenges, Architectures, Platforms and Applications: A Survey, International Journal of future computer and communication, vol. 1, no. 4 Dec. 2012.

Grobauer, B. T. Walloschek and E. Stocker, "understanding cloud computing Vulnerabilities, "2011 IEEE Security and privacy. Pp 50-57, DOI= March/April 2011.

http//www. Dolcera.com/wiki/ondex.php?title=cloud_ computing#cloud_computing_comparison_of_different_ve ndors.

Usha Albuquerque and Nidhi Prasad,"Career in Cloud Computing", Employment News. Vol XLI, No. 46 pp1, New Delhi, DOI: 11 to 17-Feb-2017.

http;//www.jatit.org/research/introduction_grid_computing.htm l.

http://cloudcomputingapps.org/what-is-the-difference-between-grid and cloud computing.html.

Wenke J: Jiangbon Ma, Nanging, P.R.C., Xiaoyong Ji A Reference Model of Cloud Operating and Open Source Software Implementation Mapping by 2009.

Zhang, S. S.F. Zhang, X.B. Chem, and X.Z. Huo," Cloud Computing Research and Development Trend", In Proceedings of the 2010 second International Conference on Future Networks(ICFN' 10). IEEE Computer Society Washington, DC, USA. Pp 93-97. DOI: 10.1109/ICFN. 2010.58.

Daniel Nrmi, Rich Wolski, Chris Grzegor czyk, Graziano obertelli, Sunil Soman, Lamia Youself, Dmitrii Zagorodnov," the Eucalyptus open-source Cloud-computing system', 9th IEEE/ACM International symposium on cluster computing and the Grid, 2009.

Junjie Peng, Xuejun Zhang Lei Bofenglhang, wu zgang, Qing Li "Comparison of several cloud computing platforms", 2009 IEEE. 66

Clp:cloud provider.techtarget.com/definition/cloud-provider.

Robert W. Lucky May 2009, Reflections Cloud Computing, May 2009. IEEE Spectrum