STUDY OF GRID & CLOUD COMPUTING: A COMPARATIVE ANALYSIS

Mr. Sanghesh B. Bele, S.K. Totade

Deptt. Of MCA, Vidya Bharati Mahavidyalaya, Amravati.

Abstract: - Cloud Computing is the emerging field in Information Technology. It is growing day by day due to its features of services. The Cloud computing is the development of parallel Computing, Distributed Computing & 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 & cluster computing.

Cloud computing is computing platform for sharing resources which include software's, business process, infrastructure & applications. It is also relies on technology of virtualization.

In this paper, we will discuss about grid & cloud computing & 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.

Keywords: - **Grid Computing, Cloud Computing, architecture, SLA.**

Introduction

Nowadays, the term "cloud computing" has been an important term in the world of Information Technology (IT).Cloud computing is a kind of computing which is highly scalable and use virtualized resources that can be shared by the users.

In olden days, there was time shared computing system. 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 .

The idea of cloud computing is to come to existence to reduce the cost of computing, to increase reliability & increase flexibility by transforming computers. Technically speaking, grid computing enables the virtualization of the distributed computing & data resources i.e. processing, network bandwidth & storage capacity to create a single system image, granting users & applications access to vast information technology(IT) capabilities.

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 & distributed systems that enable the sharing, selection, aggregation of geographically distributed autonomous resources at runtime which is depending on their availability, capability, performance, cost & user-quality-of-service requirements .It is shared collection of reliable & unreliable resources. It is a collection of servers that are clustered together. Grid computing is all about sharing, aggregating, hosting & offering service across the world .

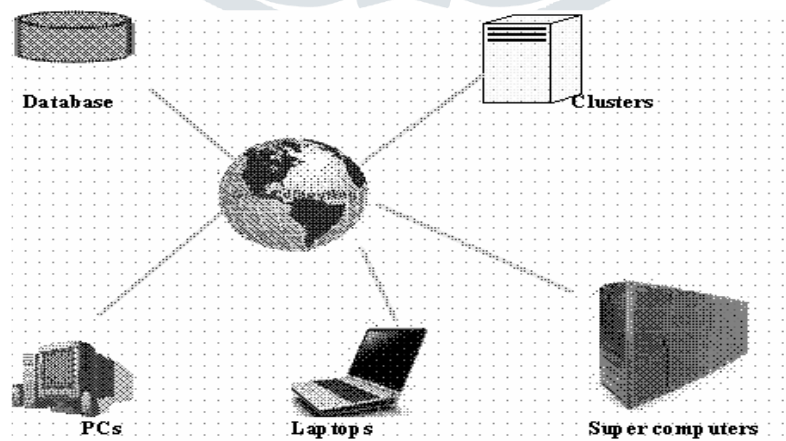The concept of Grid Computing will get cleared from Fig. 1

Fig 1: Grid Computing

Grid Computing Architecture: -

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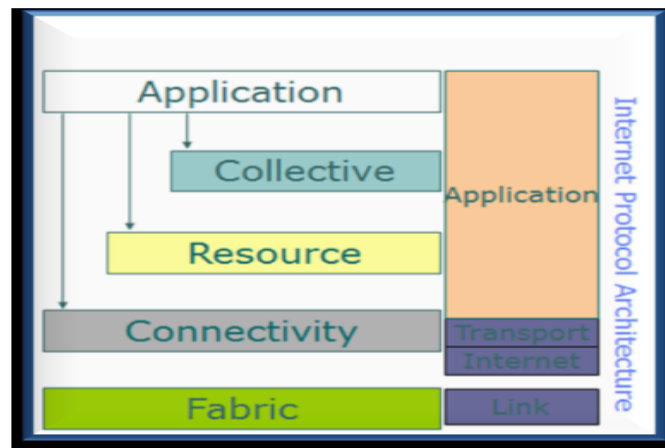
Fig. 2 : Architecture of Grid Computing

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
(1) Access to Additional Resources: In addition to CPU and other storage resources, a grid can also provide other resources as well.
(2) 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.
(3) 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
(1) Not Stable: Grid software and standards are not stable in comparison to other computing. Its standards are still evolving.
(2) High Internet Connection Required: Gathering and assembling various resources from geographically dispersed sites require high internet connection which results in high monetary cost.
(3) 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 . It is a complete new technology. It is the development of parallel computing, distributed computing, & grid computing. It is the combination & evolution of virtualization, utility computing, Software – as –a-Service(SaaS), Infracture-as-a-Service(IaaS), Platform-as-a-Service(PaaS) & Data-as-a-Service(DaaS).

"Cloud is a Parallel & Distributed computing system of a collection of inter-connected & virtualized computer based on service level agreements (SLA).
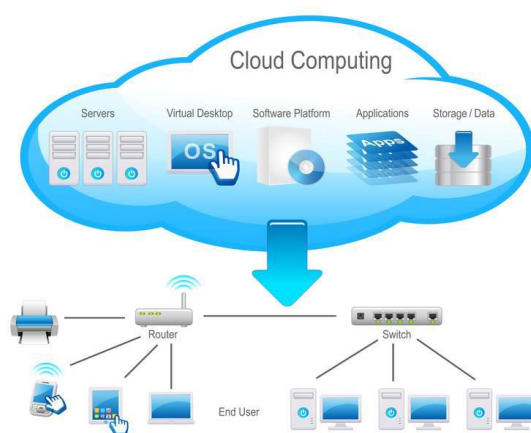

Fig 4: Cloud Computing

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

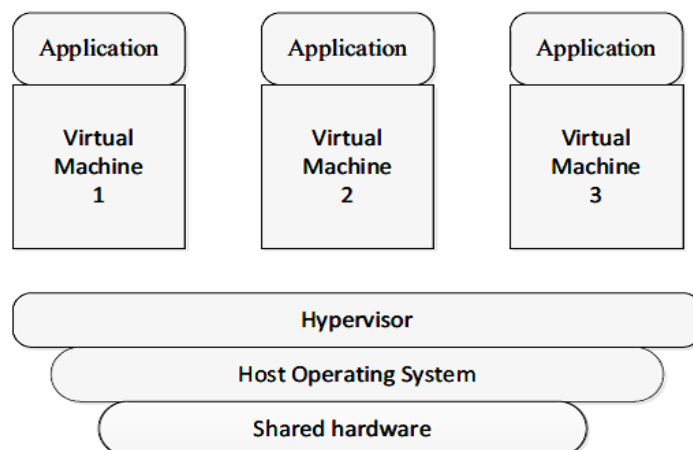**Cloud Computing architecture**:
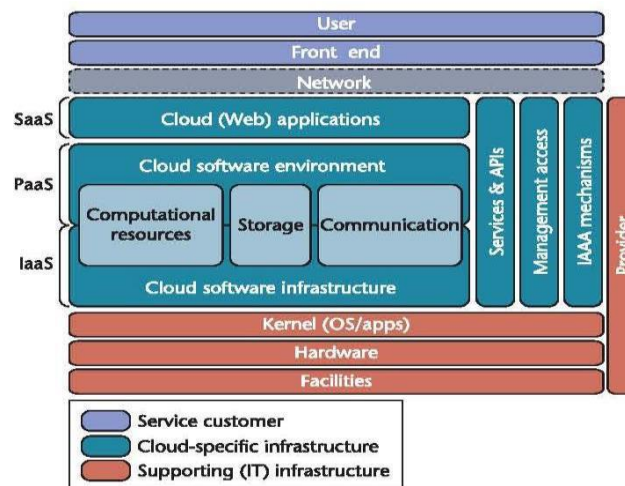

Fig 6: the Cloud architecture

Fig 7: the Cloud reference architecture

The Fig. 6 & Fig. 7 shows a cloud reference architecture that makes the most important security cloud components explicit & provides an abstract overview of cloud computing for security issue analysis.

The services 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 BigTable, Amazon simpleDB)

- 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)

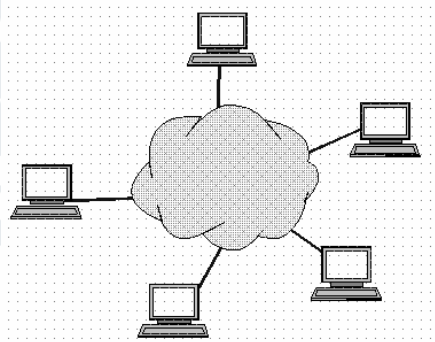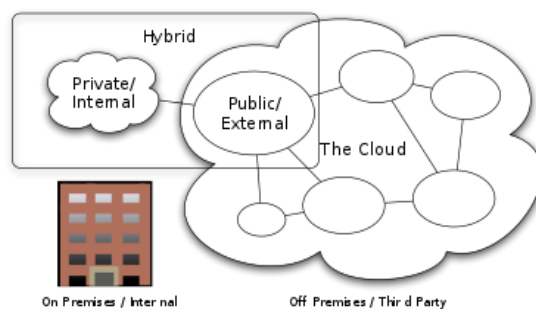The concept of Cloud Computing will get   cleared from Gig. 7.

Fig 8: Cloud Computing

Cloud Computing Types:
Public, Private & Hybrid Cloud:-

Fig. 9: cloud computing Types

Public Cloud

It is not proprietary of any organization; the services provided in these clouds can be accessed by any organization.

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

It is a proprietary architecture subscribed by an organization, which provides hosted services to the users within the organization. This is protected by the firewall to form a barrier against outside the world to access hosted services from the 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.

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

Faster, simpler and cheaper services

1. Highly elastic because resources are easily released or occupied on the basis of demand.
2. Optimized utilization of computing resources.
3. Users have more resources than actually they have like unlimited storage etc
4. Everything is provided as service.
5. Less power consumed on hardware and software
6. High availability and scalability.
7. No data loss.

Comparism between Grid & Cloud Computing:

Grid Computing	Cloud Computing
Cha. Of Grid Computing 1. Loosely coupled (Decentralization) 2. Diversity & Dynamism 3. Distributed Job Management & scheduling	Cha. Of Cloud Computing 1.Dynamic computing infrastructure 2.It service-centric approach 3.Self-service based usage model 4. Minimally or self-manged platform 5. Consumption-based billing
In grid computing, the computers do not have to be in the same physical location & 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 & 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 & virtualization computing.
Grid is inherently distributed by its nature over a LAN, WAN.	Clouds are mainly distributed over MAN.
Areas of Grid Computing 1.Predictive Modeling & Simulations 2. Engineering Design & Automation. 3. Energy Resources Exploration 4.Medical, Militry & Basic Research 5. Visualization	Areas of Cloud Computing 1. Banking 2. Insurance 3. Weather Forecasting 4. Space Exploration 5. Software as a service 6. Platform as a service 7. Infrastructure as a service 8. Data as a service
Any Std. OS(dominated by Unix)	A hypervisor(VM) on which multiple Oss run
Benefits of Grid Computing 1. Exploiting underutilized resources 2. Parallel CPU capacity 3. Virtual organization for collaboration & virtual resources 4. Access to additional resources 5. Reliability 6. Management	Benefits of Cloud Computing 1.Flexibility 2. Disaster recovery 3. Automatic Software updates 4. Free capital-expenditure 5. Work from anywhere 6. Document control 7. Security

Short Comparison between Cloud and Grid:

Char	Grid	Cloud
Business model	Adopts project oriented business model	Uses Pay-as-you-go model.
Application model	Executing tasks may be small or large, loosely coupled or tightly coupled, compute Intensive or data intensive.	Supports only loosely coupled and transaction oriented,Mostly interactive jobs.
Security model	Grids build on the assumption that resources are heterogeneous and dynamic. Thus security is engineered in fundamental grid infrastructure.	Cloud security is now in its in-Fancy.

Applications of Cloud Computing

Following are some applications of cloud computing

- Cloud computing provides dependable & 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 & 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 & easier management of data, because all data is located on central server so that administrator can control who have access to files . It also reduces runtime & response time, minimizing the purchasing & 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 & 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.

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