CLOUD COMPUTING-TECHNOLOGIES

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Abstract: Cloud computing is pictured as the next-generation technology. It is a web-based technology where quality services are provided to users including data and software, on remote servers. Cloud computing is just like as called Data outsourcing as an outsider gives storage services to the client. There is producing good result for the customers without costing a lot of money for equipment and programming for information storage. Cloud computing eliminates the need of having a complete infrastructure of software and hardware to meet clients requirements and applications. It can be thought of or considered as an entire or an incomplete outsourcing of hardware and software resources. To access cloud applications, a fast Internet connection and a standard Internet browser are required. It offers an on-demand and scalable access to a shared pool of resources hosted in a data Centre at providers' site.

Keywords: Cloud computing, Technologies of cloud computing, Virtualization, SOA, Grid Computing, Utility Computing.

1. INTRODUCTION

The term Cloud refers to a Network or Internet. It implies that Cloud is something, which is available at a remote area. Cloud can give benefits over system or web, i.e., on open systems or on private systems. Applications such as email, web conferencing, customer relationship management (CRM), all keep running in the cloud.

Cloud computing depends on web computing where virtual shared servers give software infrastructure platform devices and other resources and hosting to clients in view of on a compensation as you utilize the services. All data that a digitized system as to offer is provided as a service in the cloud computing model.

Cloud computing provides its client with numerous capabilities like getting to an extensive number of uses without the requirement for having a permit, buying, introducing or downloading any of these applications. It likewise diminishes both running and installation costs of computers and software as there is no need to have any infrastructure. Clients can access data anyplace; all they require is to interface with a system (usually the Internet).

Cloud computing clients don't claim the physical framework rather they rent the usage from a third-party provider. They consume resources as a service and pay just for resources that they utilize. Most distributed computing foundations comprise of administrations conveyed through regular focuses and based on servers.

In today world, each organization needs to begin looking out where precisely Cloud Computing (CC) is required in their business with the goal that they gain a competitive advantage by staying and remaining competitive in their business sector. An exceptional characteristic of cloud computing is it pay per use one as the cloud user is only required to pay just for the used services [1].

This paper clarifies a brief overview of cloud computing, its services and deployment models, recognizing different characteristics of cloud computing and the technologies of cloud computing.

Cloud computing offers organization an expanded storage than traditional storage systems. Software updates and are very robotized with the diminished number of employed exceptionally talented IT personnel [2].

There are various types of services and models working behind the scene making the cloud computing practical and open to end clients. For the most part, there are two kinds of working models for distributed computing:

Distinctive sorts of administrations and models working behind the scene making the distributed computing practical and open to end clients. For the most part, there are two kinds of working models for distributed computing:

A. Deployment Models.
B. Service Models.

A. **Deployment models:**Deployment models characterize the type of accessibility to the cloud environment i.e., how the cloud is found? Cloud divide the accessibility into four types: Private, Public, Hybrid and Community.

1) **Public cloud:**This cloud is accessible to all the external clients through theinternet who can register with cloud and can utilize cloud resources on a pay-per-use model. This cloud isn't secure like private cloud. It can available for all internet users because of its openness. It is relatively less customizable than private cloud. The cloud infrastructure is possessed and managed by a large Cloud Service Provider (CSP).The cloud supplier is in charge of the creation and on-going support of general public cloud and its IT resources. The open cloud is likewise called the external cloud, where resources are powerfully provisioned on a self- self-benefits over the web.
Example: email, Google AppEngine, Microsoft Azure or Window Azure and Amazon Elastic Compute Cloud (EC2).

2) Private cloud: This cloud is setup particularlyfor an organization within its own data center. The organizations manage all the cloud resources which are owned by them. The private cloud offers greater security when contrasted with an open or Hybrid cloud.Private cloud resources are not as cost-effective as compared to public clouds but rather they offer more productivity than open cloud. The cloud is overseen by an association and serves it exclusively; it can exist inside or outside the organization's perimeter. Private cloud is likewise called the inward or corporate cloud, which gives facilitated gadgets to a predetermined number of individuals behind a firewall.

3) Community cloud: A few organizations together build and offer a similar cloud infrastructure and also policies, requirements, values and concerns. The community cloud forms into a level of economic scalability and democratic equilibrium. The cloud infrastructure could be facilitated by a third-party vendor or inside one of the organizations in the community. The cloud is overseen by a few organizations and backings a particular community that has a similar intrigue. community cloud is extra secure than the public cloud.

4) Hybrid cloud: It is a group of public, private and community cloud. However, the critical activity is achieved by private cloud whereas the non-critical activity is achieved by public cloud. Public cloud is more costly than private cloud, in this way hybrid cloud can have this saving. Thehybrid cloud models dependent on internal IT infrastructure, thusly it is important to guarantee excess crosswise over data centers.
For example, a cloud client may pass on cloud services dealing sensitive information data to a private cloud and other, less sensitive cloud services to a public cloud.

B. Service models: A cloud can connect with a customer (client or application) in an assortment of courses through abilities called services [3]. Services Models are the functional models where the Cloud Computing is based. Across the web, three major types of services have emerged or model of services have emerged.

1. Infrastructure as a Service (IaaS).
2. Platform as a Service (PaaS).
3. Software as a Service (SaaS).

1) Infrastructure as a service (IaaS): Cloud computing providers offer physical and virtual computers, additional capacity organizing gadgets etc. The virtual machines are controlled by hypervisors that are sorted out into pools and controlled by operational emotionally supportive networks. It is cloud clients obligations to introduce working framework pictures on the virtual machines and in addition their application programming. IaaS enables the cloud provider to openly find the infrastructure over the Internet in a practical way. IaaS resources, like, storages, bandwidth, monitoring services, IP addresses, firewalls, virtual machines and so on, all are made accessible to the consumer on rent. The consumer needs to pay based the time allotment a consumer holds a resource.
Examples: Rackspace, Windows Azure, Amazon EC2, Google Compute Engine.

2) Platform as a service (PaaS): It is the delivery of application development and deployment platform overthe internet as a service to developers, who can use the platform to build, deploy and manage SaaS applications easily. It also offers improvement and deployment devices, required to make applications. The primary element of PaaS has a point-and-snap apparatus that empowers non-designers to make web applications. Buyer requires not purchase expensive servers, equipment, and power and information storage. Hence, it is anything but difficult to scale down or scale up consequently based on application resource requests.
Examples: Force.com, Google, Apache StratosApp, Engine, Windows Azure, AWS Elastic Beanstalk.

3) Software as a Service (SaaS): It is the conveyance of Applications (e.g., ERP or CRM) as a help of end customers over the web through browsers. Cloud customers can use that is as of now installed and running on the cloud infrastructure. In this manner, there is not necessary of installing and running the software application all alone PCs. And also the need for software maintenance and support is reduced. Some of the SaaS applications are not adaptable, for example, an Office Suite. In any case, SaaS gives us Application Programming Interface (API), which enable the developers to build a customized application.
Example: Google Apps, Microsoft Office 365.

2. CHARACTERISTICS OF CLOUD COMPUTING

Cloud computing have some of the following characteristics in order to meet client or user requirements and to provide qualitative services.

1) **High scalability:** It means on request provisioning of resources on a huge scale without requiring human cooperation with each service provider.
2) **High availability and reliability:**The availability of servers are more reliable and high henceforth it limits the chances of disappointment in the infrastructure [4].
3) **Agility:** It shares the resources among users and works very quickly.
4) **Multi-sharing:** Various customer and applications work all the more adequately with less cost by sharing fundamental infrastructure utilizing distributed computing.
5) **Maintenance:** Maintenance of cloud computing applications is easier as they are not required to be installed on each computer and can also be accessed from various places, ultimately reducing the cost.
6) **Low cost:** It is cost effective because the company no more needs to set its own infrastructure. It pays according to resources it has consumed.
7) **Services in pay-per-use mode:** APIs (Application Programming Interfaces) are given to the clients for accessing the services on the cloud and pay on the basis of service is use.
8) **On-Demand Self Service:** Cloud Computing allows the clients to use services and resources on request for human interaction with cloud service providers. One can logon to a website whenever

and use them. Computing resources include virtual machines, processing power, storage etc.

9) **Broad network access:** Resources such as virtual machines, storage, processing power, can be accessed over a internet using heterogeneous gadgets like mobiles phones, laptops, computers, etc. Since cloud computing is internet based, it can be accessed at any time and from anywhere[5].

10) **Resource Pooling:** Cloud computing allows multiple occupants to share a pool of resources. One can share asingle physical instance of database, hardware and basic infrastructure. For example, a physical server may host several virtual machines belonging to different users[6].

11) **Rapid elasticity:** It is very easy to scale the resources up or down at any time. Resources used by the customers or currently assigned to customers are automatically monitored and resources. It makes it possible.

12) **Measured Service:** In Measured service cloud provider controls and monitors every one of the parts of cloud service. itdepends on capacity planning, Resource billing, optimization and etc.

3. CLOUD COMPUTING TECHNOLOGIES

There are different innovations that are working behind the cloud computing platform to make it reliable, adaptable and usable and they are:
A. Virtualization
B. Service-Oriented Architecture (SOA)
C. Grid computing
D. Utility Computing

A. Virtualization

Virtualization is a procedure that licenses sharing of a physical instance of resource or an application among various customers or an organization. It does so by assigning a logical name to a physical resource and providing a pointer to that physical resource when demanded [7].The main use of this technology is to provide the applications with astandard version to their cloud clients. For example, if the updated version of theapplication is released then cloud provider ought to provide the updated version to their clients. For example, VMware, and Xen offer virtualized IT frameworks on request. Virtual system progresses, for example, Virtual Private Network (VPN), support clients with a modified network environment to get Cloud resources. Virtualization techniques are the bases of the Cloud Computing since they render scalable and flexible hardware services. The Multitenant architecture offers virtual disengagement among the various tenants and in this way the organizations can utilize and customize the application just as they each have its own particular instance running.

Types of Virtualization

Following are types of virtualization:

1. Hardware Virtualization
2. Operating system Virtualization
3. Server Virtualization
4. Storage Virtualization

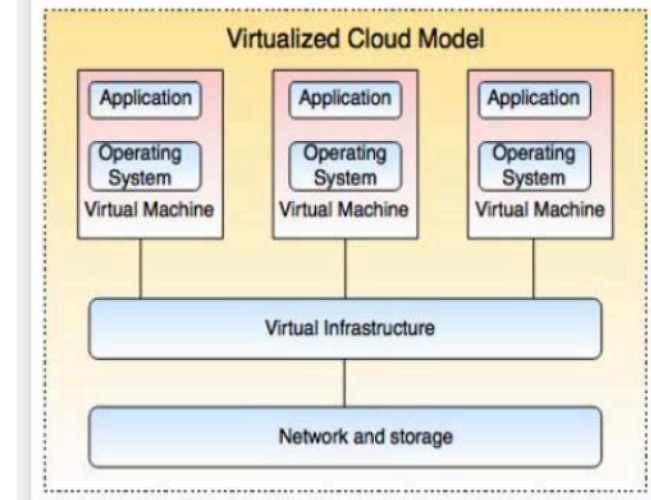The architecture of virtual cloud model is shown in the fig.

Fig: Architecture of virtual cloud model

1) **Hardware Virtualization:** If the Virtual Machine Manager (VMM) or Virtual Machine Software (VMS) is directly installed on the hardware system, it is called as Hardware virtualization. The hardware virtualization is utilized for the server platform because controlling a virtual machine is not hard than controlling a physical server. There are various types of virtualization.

2) **Operating system Virtualization:** If the Virtual Machine Manager (VMM) or Virtual Machine Software (VMS) is installed on the Host Operating System rather than being directly installed on the hardware system, it is called as Operating System Virtualization. Operating System Virtualization is improved the situation testing the applications on various platforms of OS.

3) **Server Virtualization:** If the Virtual Machine Manager (VMM) or Virtual Machine Software (VMS) is directly installed on the server system, it is called as Server Virtualization. If single physical server is divided into multiple servers for balancing the load on demand basis, then Server Virtualization is used.

4) **Storage Virtualization:**The process of gathering the physical storage from various network storage devices is known as Storage virtualization. After gathering multiple storage devices to the physical storage would seem that a single storage device. Storage virtualization is utilized for back-up and recovery purposes.

B. Service-Oriented Architecture (SOA):
Service-Oriented Architecture utilizes applications as a service for other applications. in any case the sort of seller, item or innovation... In this way, it is conceivable to trade of information between utilizations of various sellers without extra programming or rolling out improvements to service. The cloud computing Service-Oriented Architecture is shown in the fig.
SOA is an application structure which takes everyday business applications and divides them into particular

business procedures and function called Services.this component of cloud innovation enables associations to get to cloud-based registering arrangements with highlights that can be adjusted on request, as business needs change.SOA places the commitment and expenses of deployment,development, and support of web benefit parts on the web services supplier, which allows a web services purchaser to get to different web services without the cost or overhead that is connected with conventional methods for IT services . SOA is a successful mechanical piece of distributed computing since it energizes incorporated appropriation and fragment reuse, which essentially drives down the cost of programming advancement and conveyance. Service-Oriented Computing introduces and diffuses two important concepts, which are also fundamental for Cloud computing i.e Quality of Service (QoS) and Software as a Service (SaaS) [8]. Quality of Service identifies a set of functional and non-functional attributes that can be used to evaluate the behavior of a service from different perspectives and the Software as a Service introduces a new delivery model for applications. It has been inherited from the world of Application Service Providers (ASPs).
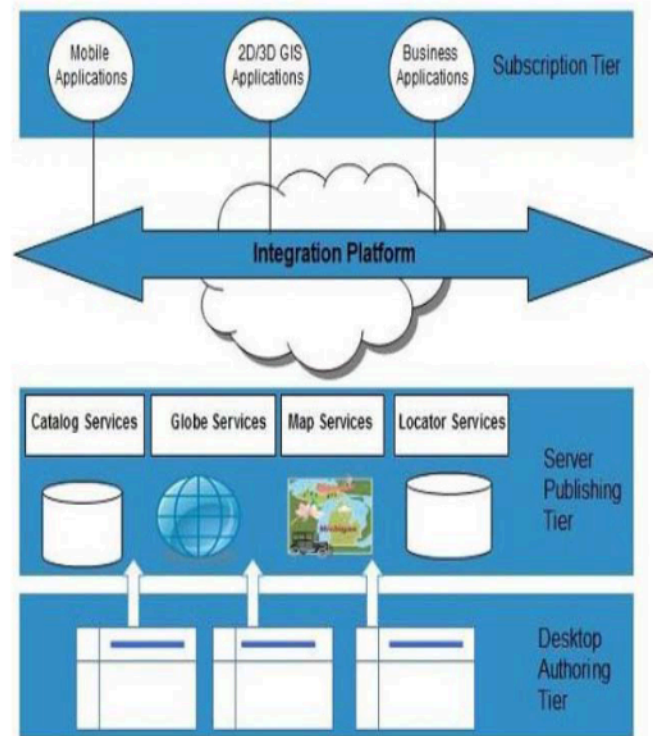

Fig: Service-Oriented Architecture

C. Grid computing:

Grid Computingis defined as distributed computing in which a number of computers from multiple areas are connected together to achieve a common goal. The computer resources are different and geographically spread.. therefore,Grid Computing breaks a large problem into smaller pieces.So, These smaller pieces are disseminated to systems that reside within the grid. Grid system is intended for sharing of resources through distributed and huge -scale cluster computing. Grid computing is popular in e-science, forms of research that often require huge computing power and collaboration between various data and computing services.

Planning applications on Grids can be a mind boggling errand, particularly while organizing the stream of data over circulated registering resources. Network work process frameworks have been made as a particular type of a work procedure administration framework planned particularly to create and execute a progression of work process, or a computational or, information control steps, or in the Grid setup.
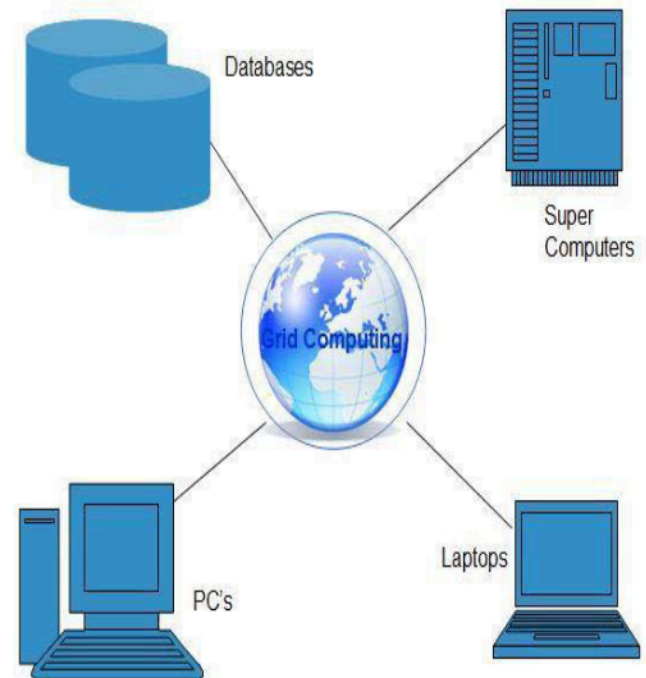

Fig: Grid Computing Architecture

A famous Grid Computing project is Folding@Home. The project involves utilizing unused computing powers of thousands of computers to perform a complex scientific problem. The goal of the project is "to understand proteinfolding, misfolding, and related diseases" [9].

D. Utility Computing:

Utility computing relies upon Pay-per-Utilize model. It gives computational resources on ask for as a metered benefit. All the managed IT administrations, Grid computing, distributed computing are an idea follow on the concept of grid computing.

In reality pricing on cloud computing can be very complex. As an example pricing of Amazon S3 as on November 2009 is explained below. Amazon charges for using US S3 are divided into three parts - storage charges, data transfer charges and charges for anumber of requests. These charges are summed together to compute the total billing.

S3 storage charges		
	US server	**Europe server**
First 50 TB / month	$0.150 per GB	$0.180 per GB

next 50 TB / month	$0.140 per GB	$0.170 per GB
next 400 TB /month	$0.130 per GB	$0.160 per GB
over 500 TB / month	$0.120 per GB	$0.150 per GB

Data transfer charges are further divided into data transfer input and data transfer output. Data transfer rate for incoming data $0.100 per GB. Data transfer rate for outputting data is explained in the table below.

S3 data transfer out charges		
	US server	Europe server
First 10 TB / month	$0.170 per GB	$0.170 per GB
next 40 TB / month	$0.130 per GB	$0.130 per GB
next 100 TB /month	$0.110 per GB	$0.110 per GB
over 150 TB / month	$0.100 per GB	$0.100 per GB

S3 charges for requests made		
	US server	Europe server
Per 1,000 PUT, COPY, POST, or LIST requests	$0.01	$0.012
Per 10,000 other requests	$0.01	$0.012

Utility computing helps in reducing initial investment. As the computing requirements for an individual or an organization changes, the billing changes accordingly, without incurring any additional cost. If the usage has reduced, then billing will also reduce accordingly.

4. CONCLUSION

Cloud computing can be viewed as anew phenomenon which is set to change the way we utilize the Internet, there is much to be careful about. There are numerous new advances rising at a fast rate, each with mechanical headways and with the capability of making human's lives simpler. This paper clarifies a brief overview of Cloud Computing, Deployment Models and Service Models, Cloud computing techniques, Virtualization, SOA, Grid Computing and Utilities of Cloud Computing. We meant to center around the introduction and depiction of the developing patterns in thetechnology utilized for cloud-based services. Several types of research were made in this field with a specific end goal to offer the on-request benefits for the clients and limit downtime while moving VM's memory starting with one physical host then onto the next. We will attempt later on to unite them to build up a reasonable approach to describe, find, form and manage computing resources and network components constituting the cloud based of the SOA idea. This technique will give the adaptability and scalability expected to guarantee interoperability amongst systems and heterogeneous resources shaping the cloud. We will center around the dynamic creation of systems shaping cloud and permit the disclosure, decay and execution services "cloud services" on request. The association and arrangement of these administrations will be managed ideally under SOA.

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