CLOUD COMPUTING: Beginning of a New Era

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ABSTRACT

"Cloud" computing which is a very new term for IT industries is defining the paths ahead in computer science world. It is the result of many years research which consumes all the new achievements in virtualization, distributed computing and networking. It has changed the whole consequences. Cloud computing reduces cost of computation & storage to a large extend and it also improves productivity. Cloud has grown from capable business applications to wildest growing information technology industries. Cloud offers services such as storage, computation & applications for different types of markets. Its foreground is to provide secure, quick, convenient data storage and computing service centered by internet. In this paper I consider about cloud computing, its types, its working model, its architecture and various benefits or drawbacks.

Key words: Cloud Computing, Private, Public, Community, Hybrid, SaaS, PaaS, IaaS.

1. INTRODUCTION

Cloud Computing is a recent term that defines the paths ahead in computer science world. It focuses on sharing the data over a scalable network of nodes. ``A Cloud is a type of distributed and parallel system which consists of a collaboration of inter-connected and virtualized computers which further are dynamically presented and provisioned as one or more combined computing resource(s) based on service-level agreements (SLA's) established through the negotiation between the consumers and the cloud service provider [1]." Through cloud computing we are saving our document or data to the Internet rather than to save it on some computer's memory. So that it facilitate us for accessing our document or data from anywhere and through any device connected to the internet. It also provides a shared pool of resources such as data storage space, networks, computer processing power, and specialized corporate applications. When people are storing photos through online mode instead of store it on some computer hard disk than people is using a cloud computing services.

Cloud computing is very helpful in various field due to its scalability, cost effectiveness and flexibility. Cloud computing resources are provided in virtualized and abstracted manner. It is managed by specialized service providers in comparison to the conventional computing where all the information is located on end user's computer system [2]. So cloud computing has simplifies storage, distribution, operation and maintenance of information systems and also increases efficiency, availability and reliability of system while reducing its cost [3]. Cloud systems need less experience to work with it as it is very user friendly. It is proficient of

running the same program on different connected computers at the same time.

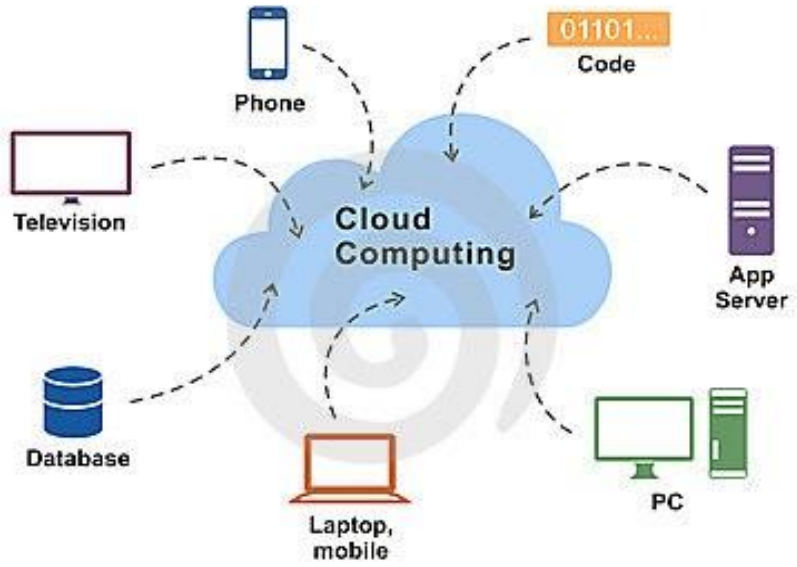

Figure1 Layout of Cloud Computing

1.1 Cloud computing characteristics

- One can access their data from anywhere and anytime (if Internet is available) because the data is stored at cloud.
- As the data is not stored on any local computer hard-drive, so the process of recovery of data is easy.
- Cloud computing is scalable and it has the capacity of scaling the resources. Cloud is infinite and one can purchase the power of computing as per need.
- IT professionals need not updated software every time because it is the job of cloud provider now.
- Cloud service are controlled and monitored by service providers. This may helps in resource optimization and capacity planning.

2. Cloud Computing Architecture

Cloud computing architecture is divided into two parts:

- Front End Part
- Back End Part

The front end part includes the client's computer and the various applications that are required to access the cloud computing system. It includes the services like e-mail programs, uploading photos etc.

On the back end system are the various computers and servers that create the cloud for computing services. Usually, each application has its own dedicated server.

The central server play the role of administrator to administrate the system with monitoring

traffic with client demands to ensure everything runs easily. It follows some protocols and uses a distinct kind of software called middleware.

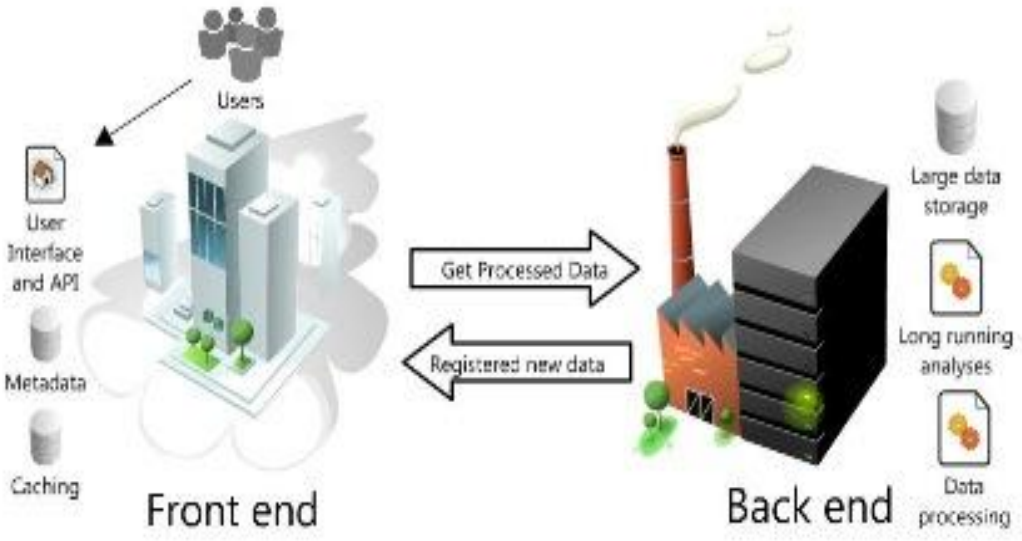

Figure2 Architecture of Cloud Computing

3. Various types of cloud

- Private Cloud
- Public Cloud
- Community Cloud
- Hybrid Cloud

Private Cloud:

Private cloud is rented and owned by any organization. The organization uses the various cloud resources for its private use. These types of clouds are personally built by an organization for serving their various business needs.

Public Cloud:

Public cloud works in which all the resources that are owned by cloud provider and it sell the resources to public on demand. End users cantake the resources on rent and pay as per usage. Google, Amazon and Microsoft are some of the examples of public clouds.

Community Cloud:

Community cloud is a type of private cloud in which resources are shared between the members of closed community which have same resource requirements. The Media Cloudis the example of community cloud setup by Siemens IT Solutions and Services [4]. This type of community cloud may be operated by join efforts of all or by a third party alone.

Hybrid Cloud:

This is the combination of two or more above mentioned cloud types (private, public or community). The motive of this type of cloud is to give some extra services and resources to the users for their high demands.

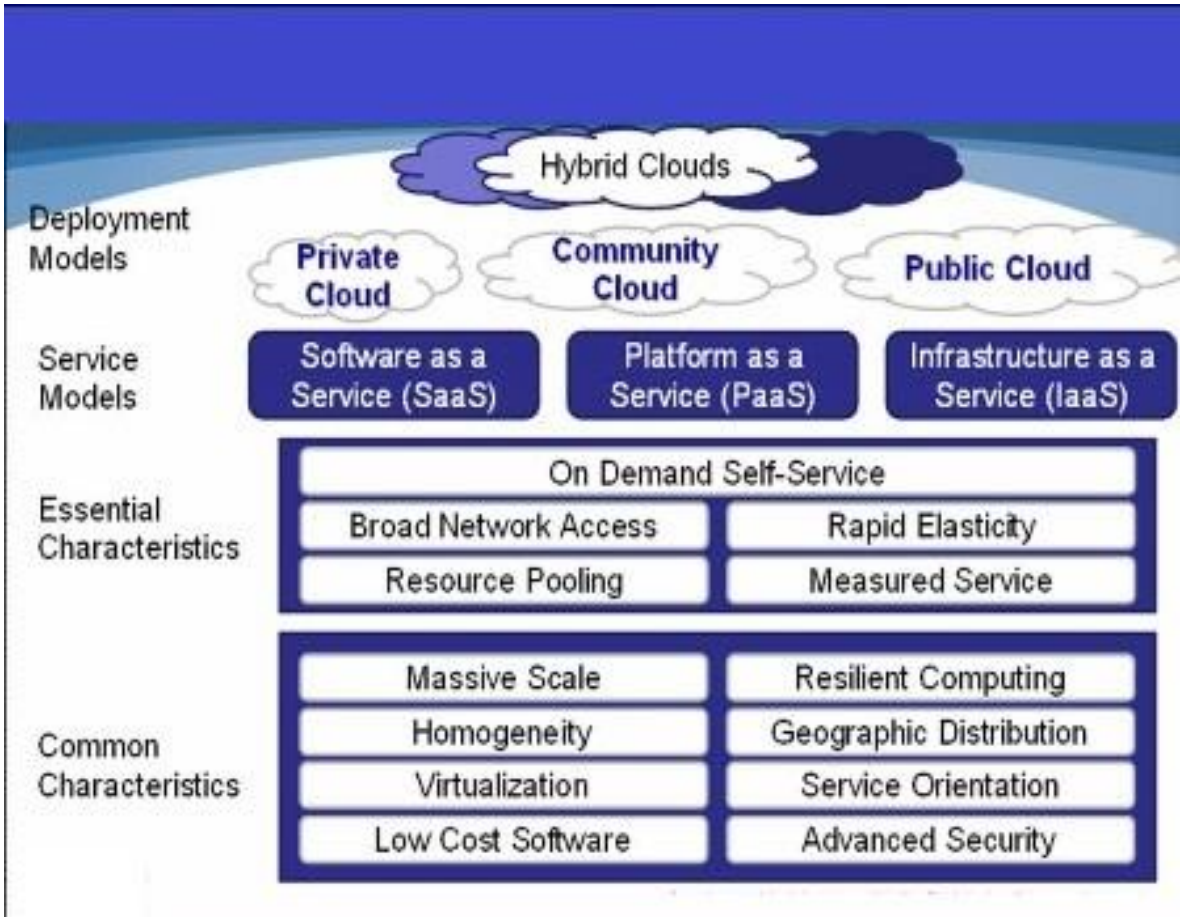

Figure3Cloud definition provided by NIST [7]

4. Service Model of Cloud Computing

Cloud computing includes mainly following service models:

- **Software as a service (SaaS)**
- **Platform as a service (PaaS)**
- **Infrastructure as a service (IaaS)**

SaaS-

Software as a Service (SaaS) is a software distribution model in which various applications are hosted by a service provider and made available to customers over the Internet. SaaS is a progressively wide spread delivery model that support Web services and service-oriented architecture (SOA).SaaS is closely related to the application service provider and on demand

computing software delivery models. In software on-demand model, it the provider who provides all the users to a network-based access of a single copy of an application that created specifically for SaaS distribution.

Aids of the SaaS model include:

- Easier administration
- Automatic updates
- All users have similar version of software
- Global accessibility

PaaS-

Platform as a Service (PaaS) is a way to get hardware, operating systems and storage on leaseover the Internet. The service delivery model permits the customer to take virtualized servers and associated services on lease for running existing applicationsand testing the new ones.PaaS has several advantages for developers:-

- Operating system features can be changed and upgraded frequently.
- Services can be gained from various sources that cross international boundaries.
- Initial and current costs can be reduced

IaaS-

Infrastructure as a Service is a model in which an organization outsources the resources that are used to maintain operations, including hardware, storage, servers and various networking components. The service provider keeps the equipment and is liable for running and maintaining it. Clients pay the cost as they use the resources.

Characteristics and components of IaaS include:

- Utility computing service
- Administrative task's automation
- Dynamic scaling
- Desktop virtualization
- Policy-based services
- Internet connectivity

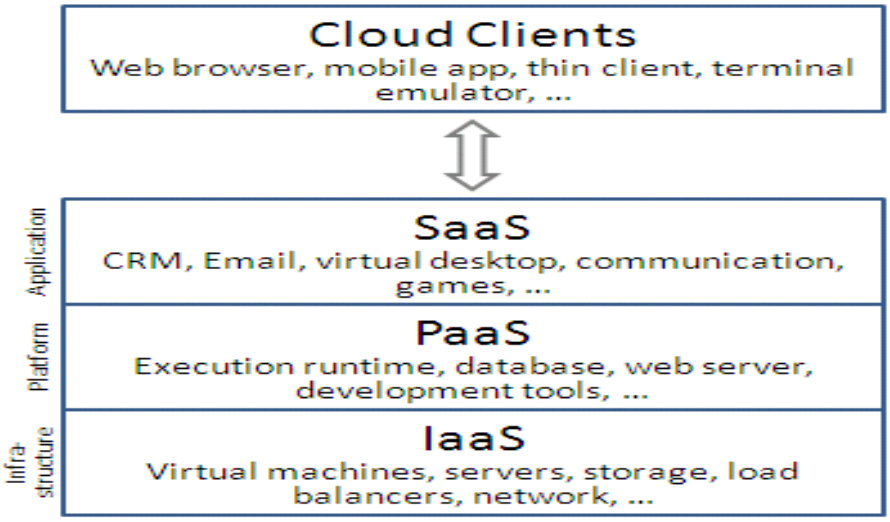

Figure 4 Service model of Cloud Computing [6]

5. Working of Cloud Computing

To know about cloud computing working one would have to assuming that the cloud consists of the layers namely Back-end layers and Front-endlayers. The front-end layers is user interact layers. When users access their email like on Gmail, for example, they are using software that is running on the front-end of a cloud. The same situation is happening when user access their Facebook account. The back-end consists of the hardware and much software architecture that fuels the interface that usersees on the front end [5].The cloud computing system includes various storage servers and a master control server. Using cloud the information is stored at a remotely located database that further owned by a third party (say, cloud provider) rather than on computer's hard drive. The internet serves as a path in between user and cloud. The users can run their data from any location having internet facility. They don't need to carry heavy storage devices along with them.By using cloud storage, user needs not to store the data on their hard drive. Instead, they can access it from any location and download it on any device of their choice, including laptops, tabletsor smartphones. Moreover, they can edit files like Word documents or PowerPoint presentations, simultaneously with other users, making it simpler to work away from the office.There are various types of cloud computing services existing to suit different needs.

SLA Resource Allocator or Service Level Agreement Resource Allocator is a bridge between the cloud structure and the user. It includes following parts:

- Service Request Examiner and Admission Control: It is the first for handling user service request and understands the quality of service requirement before making final decision of accepting or rejecting request.
- Pricing: It is the way to manage the service demand on cloud resources and raise the profit of cloud provider. One can have various ways through which service request can be charged.

- Accounting and SLA Management: Here the role of accounting is to note the actual usage of resources on request and then calculate the actual cost so that it could charge from the user. The role of SLA management is to track the SLA of customer with cloud provider.
- Virtual Machine and Application Monitor: Here it is used to make track of available virtual machine and their resources.
- Service Request Monitor: It makes the track of all the service requests that are in execution.
- Dispatcher: It is responsible for deploying the various applications on right virtual resource.

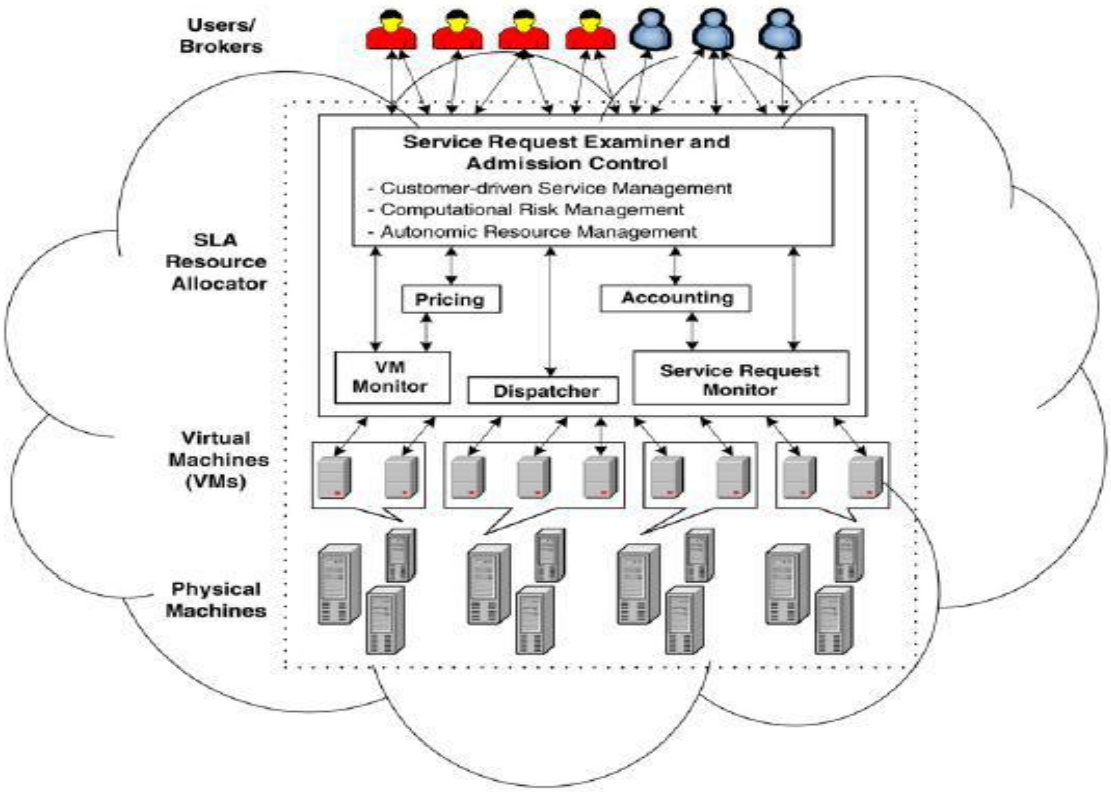

Figure 5 Architecture of Cloud Computing

Requirements for Cloud Computing Implementation:

Cloud delivers services in an on-demand environment. Several applications supported by the cloud must be secure, fast and always be available [8]. To achieve this, it needs to build a dynamic infrastructure with four following properties:

- Transparency:Regardless of the physical implementation of the services within the cloud it must be transparentlyprovided to all the users. Its actual implementation is hidden from the end users. The entire cloud appears as a single resource to its users and helps to create a virtual environment for them.
- Scalability: As number of users is increasing every day so the cloud must be scalable to handle their demands. Some the application requires multiple servers for their functionality. The cloud must be scalable enough to add more & more users and servers to it.
- Intelligent Monitoring:To achieve the transparency and on-demand scalability every cloud

requires intelligent monitoring and this intelligent monitoring is required at the control node to monitor the applications delivered.

- Security: Security is the main requirement becauseall the services and associated data within the cloud are at risk if, in any case, the security of the cloud is compromised. As control node is the first entry point so that its security requirements are always high.

6. Benefits of Cloud Computing

- **Worldwide Access**- Cloud computing rises mobility, as one can access their documents from any device and from any part of the world. For many businesses, it means that employees can work from home, without carrying bulky documents. This raises productivity and allows the employees for faster exchange of information. Employees can also work with the similar document without having to be in the same place.
- **Bigstorage space** - In the past, memory was restricted by the particular device. If one would ran out of memory than they need a USB drive to back-up the current device. Cloud computing provides larger storage space, so one won't have to worry about the space on the hard drive.
- **Easily Set-Up**- One can set up a cloud computing service in short time. Adjusting the individual settings, like choosing password or selecting which devices one wants to connect to the network. After that, one can immediately start using the resources or information.
- **Automatic Updates**- The cloud computing provider is liable to make sure that various updates are available and theusers just have to download all that. This saves not only the time but also user don't need to be an expert to update the device because the cloud computing provider will automatically notify the user and also provides instructions.
- **Reduced Cost**- Cloud computing is often inexpensive. The software is already installed online, so user won't need to install it their self. There are many cloud computing applications presented for free, such as Dropbox, and cumulative storage size and memory. If user needs to spend some money for a cloud computing service, they can be pay on a monthly or yearly basis.

7. Disadvantages of Cloud Computing

- **Security**- When using a cloud computing service, users are essentially handing over the whole data to the other party. The real fact that the entities are accessing the same server which can be a cause of security issues. Companies handling private data, which might be particularly concerned about using cloud computing, as data could be harmed by virus.
- **Privacy**- Cloud computing has the risk that unauthorized users can access the data of some users. To protect this,cloud computing services provides password protection and operate on secure servers.
- **Loss of Control**- The Cloud computing entities control the users. This includes not only how much one has to spend for using services, but also what data they can store, where the user can access it from. Users depend on the provider for various updates and the backups. If by some faults, their server ceases to operate than one would have the risk of losing all your information.

- **Internet Reliance**- While Internet access is in use increasingly, it is not yet available everywhere. If the region in which the users doesn't have Internet access than they won't be able to access any of the data they have stored in the cloud.

8. Some Cloud Computing Services

- **I-Cloud-** Apple's I-Cloud allows the users to store music, documents, photos, and other files. User can then access them all from their devices. When user signs up for iCloud then they automatically get 5GB of free storage. All the other Apple applications, like calendar, mail, and many more are integrated to work effortlessly with I-Cloud.
- **Google Cloud Connect for Microsoft Office-** Google Cloud Connect allows various users to interact using Microsoft Office. This includes simultaneous sharing and editing of Microsoft Word, PowerPoint, and Excel documents. User can also save secure copies of each document.
- **IBM Smart Cloud-** IBM Smart Cloud provides numerous services for IT companies, for exampleevolving applications in the cloud or using the cloud as a backup for the company files. Through this one can use the price estimator to estimate the cost for user particular needs.

9. Conclusion

Cloud computing is a relatively new technology that gain its popularity day by day. It proposes many benefits that could immediately effects the users. Leaders of the industriespromoted cloud computing on a very large scale. Cloud computing is as simple as two persons equipped with Cloud Computing devices and being able to exchange the data such as text files or some business information with the help of internet. The presented work will give the advantages in terms of better resource allocation and to achieve the higher degree of user satisfaction. Apart from multinational organizations several small enterprises and educational institute are also using cloud services. Now employees can focus on planning and development work instead of wasting time in managing data and other resources.There should be proper care must be taken while putting crucial data into the cloud and also while negotiating for SLA with the provider. The cloud providers must ensure certain QoS and security aspects in SLA so that any of the organization could feel relax while adopting cloud services for their business.

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