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A Review Paper on Cloud Computing

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Abstract: Cloud computing is a one of the most emerging technologies. It is at top of list in different areas of computer science because of its far reaching involvements in computing, especially Big Data, Data Science. Cloud computing is the delivering many services through the Internet which include applications like data storage, databases, platforms, infrastructure and many more. Cloud computing is a complete combination of software, computation, data access and also provides storage services with on-demands resources. This paper gives a complete overview about Cloud Computing, its architecture, along with different services include in cloud computing. This paper also describes some of the advantages and disadvantages related to the cloud computing. The application area of cloud computing is continuously increasing very rapidly. Cloud Computing is a wonderful and intelligent technology in today's date. Many people and businesses use cloud for a number of reasons such as efficiency, high computing power and security, high performance, increased productivity, cost savings.

Keywords: Cloud, Architecture, IaaS, PaaS, SaaS, Private cloud, Public cloud, Hybrid cloud, Cloud Computing.

I. INTRODUCTION

Like real clouds which are the collection of water molecules, the term 'cloud' in cloud computing is the collection of networks. The user can use the modalities of cloud computing boundlessly whenever demanded. Instead of setting up their own physical infrastructure, the users ordinarily prefer a mediator provider for the service of the internet in cloud computing.[4] Joseph Carl Robnett Licklider in the 1960s developed Cloud Computing with his work on ARPSNET to interact with people and data from in any place at any time. In 1983, CompuServe presented its users as a little amount of disk space that could be used to accumulate any files they choose to upload.[6] Cloud computing is the on-demand delivery of networking, computing power, database, storage, applications, and other IT resources via the internet with a pay-as-you-go pricing. It states that the cloud computing purpose is storing and accessing the data and programs over the internet rather than the computer's hard disk.[2]

Cloud computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that gives those services. The services themselves have huge been referred to as Software as a Service (SaaS), some vendors use terms such as IaaS (Infrastructure as a Service) and PaaS (Platform as a Service).[6] The cloud computing technology has become in demand because it provides benefits to people, consumers and businesses alike, including lower costs, easier access, reduced management cost, free provision of services and higher reliability.[2] Cloud-based services are model for businesses with increasing or changeable bandwidth demands. If your requirements increase, it's easy to ruler up your cloud capacity, drawing on the service's remote servers.[6]

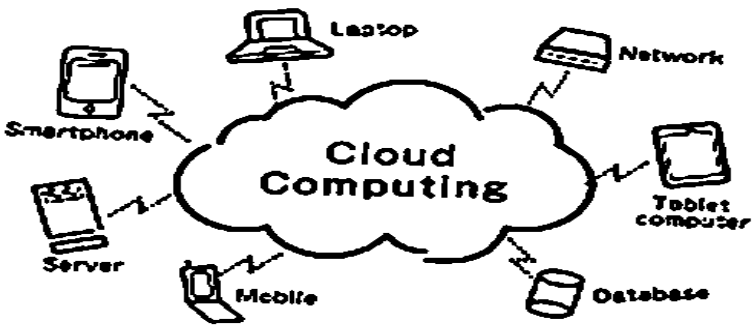

Fig.1 **A Model of Cloud Computing [5]**

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II. CLOUD ARCHITECTURE

Fig.2 illustrates the typical structure of general cloud architecture. This architecture contains massive collection of servers. This architecture represents the culture of cloud and access procedure of the cloud server. Virtualization is the key mechanism, it could be used to increase the server utilization as much the computing power available to the server, e.g. to better match the overall workload. The architecture provides a front-end interface such as a Portal that allows a user to select a service from a catalogue.[3]

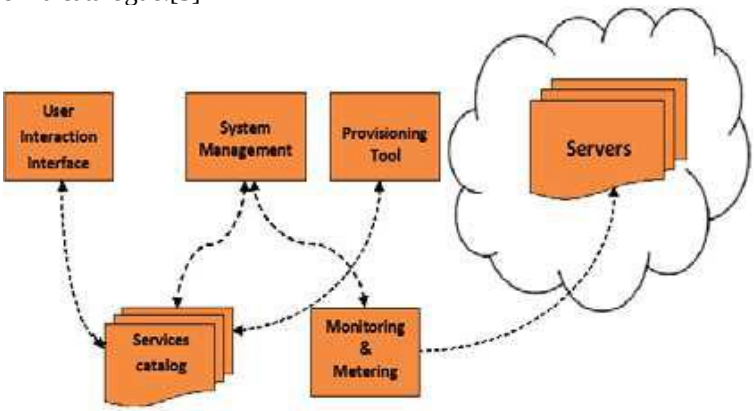

Fig.2 **General cloud computing architecture [3]**

Classifications of Cloud Computing:

Cloud Computing has four main deployment models from the architecture, each with specific characteristics that supports the needs of the services and users of the clouds in particular ways.[3]

- **Public Cloud**: Public cloud is owned by the cloud service provider companies. The clients have no authorization to control the cloud rather they just enjoy the services provided by the cloud although it seems to the clients that everything is running smoothly at their own computer due to the virtualization of the cloud infrastructure. Users don't need to buy hardware, software or supporting infrastructure, which is owned and managed by providers with public cloud services,. The cloud computing in general is shared by several organizations. Google, Amazon, Yahoo, SUN etc. are the example of public cloud service provider.[5]

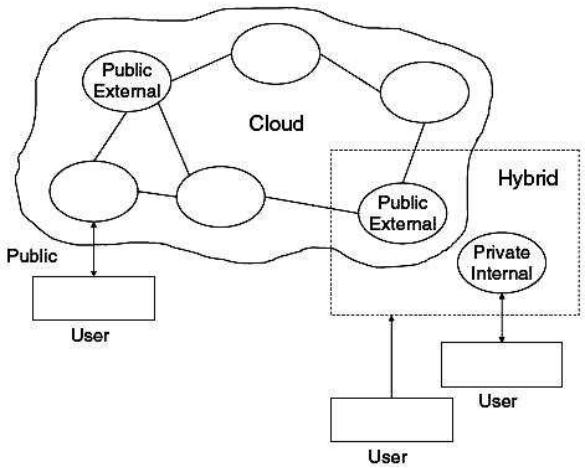

Fig.3 **Cloud Models** [3]

- **Private Cloud**: The private cloud is either owned by the company itself for its use or it may be hosted by third party but used by various lines of business and constituent groups. Private cloud is more expensive as compared to public cloud. Private clouds have two instances: On-premise private clouds and externally hosted private clouds. Both types of clouds are used by one organization but externally hosted private cloud is hosted by other

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organizations that have enough experience in cloud infrastructure. On-premise private clouds are more expensive than externally hosted private clouds.[5]

- **Hybrid clouds:** Hybrid clouds are combinations of multiple clouds that are both public and private. These clouds are created by individual customers to meet their precise needs. For example, a company may decide to create a hybrid cloud to combine a CRM system provided on a public cloud operated by Sales-Force.com with an ERP system running on their private cloud.[3]

- **Community cloud**: Community cloud infrastructure is shared by some organizations and supports a specific community that shares concerns (e.g., mission, security requirements, govt, education and compliance considerations). It may either be managed by the organizations or a third party and may exist on premise or off premise.[3]

III. CHARACTERISTIC OF CLOUD

1. On demand access.
2. No up-front commitments.
3. Pay-per-use model.
4. Nice Pricing.
5. Efficient resource allocation.
6. 24/7 hours available.
7. Easily manageable, flexible and scalable.
8. Energy efficiency.
9. Increased agility.
10. Service orientation.
11. Security.
12. High performance and reliability.
13. Accessible from anywhere. [2]

IV. CLOUD COMPUTING SERVICES

The cloud computing is the capability to deliver, on demand, a variety of IT services to users over the internet. Cloud computing service offerings into three major categories: Infrastructure-as-a-Service (IaaS),Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS).[2]

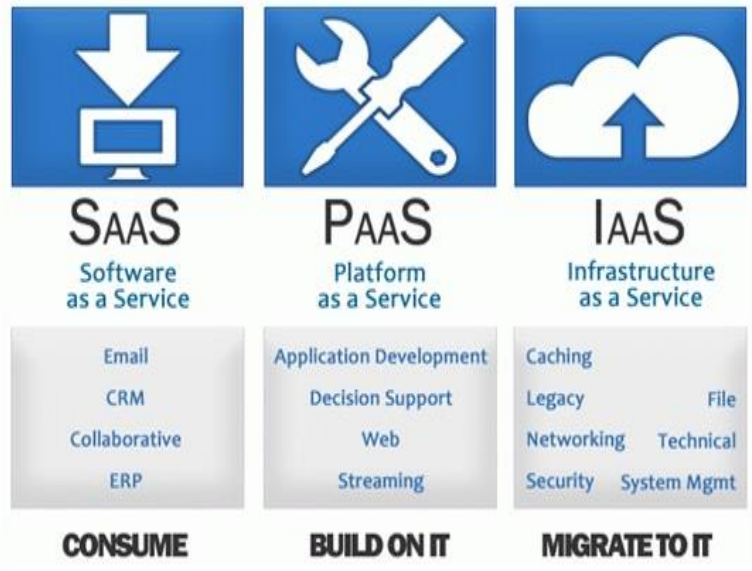

Fig.4 **Cloud Services** [8]

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- **Software as a Service (SaaS):**

SaaS is top most layer of the cloud computing service. In this model, consumers neither need install anything on their personal computer, nor have to pay considerable up-front costs to purchase the software and the required licenses.[2] Cloud consumers release their applications in a hosting environment, which can be accessed through networks from various clients (e.g., Web browser, PDA, etc.) by application users. Cloud consumers do not have control over the cloud infrastructure that often employs multi-tenancy system architecture, namely, different cloud consumers' applications are organized in a single logical environment in the SaaS cloud to achieve economies of scale and optimization in terms of speed, security, availability, disaster recovery and maintenance. Examples of SaaS include SalesForce.com, Google Mail, Google Docs, and so forth.[1]

Fig.5 **SaaS Services** [2]

- **Platform as a Service (PaaS):**

PaaS is a development platform supporting the full "Software Lifecycle" which allows cloud consumers to develop cloud services and applications (e.g. SaaS) directly on the PaaS cloud. Hence, the difference between SaaS and PaaS is that SaaS only hosts completed cloud applications whereas PaaS offers a development platform that hosts both completed and in-progress cloud applications.[1]

Client design their applications and are not concerned with hardware that may be physical or virtual, server, storage, operating systems and other low-level services. This approach increases the level of abstraction at which cloud computing take advantage but also some restrictions for the user. The user works under a more controlled environment. PaaS providers usually support multiple programming languages in platforms include Python and Java (e.g., Google AppEngine), .NET languages (e.g., Microsoft Azure), and Ruby (e.g. Heroku), force.com or Saleforce.com has made its own programming language (Apex) and an Excel-like query language, which provide higher levels of abstraction to key platform functionalities. The most popular is Microsoft Windows Azure, which provides a comprehensive framework for building service-oriented cloud applications on top of the .NET technology, hosted on Microsoft's data centers.[2]

Fig.6 **PaaS Services** [2]

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- **Infrastructure as a Service**:

IaaS is a bottom layer which delivers infrastructure on demand in the form of virtual storage, networking, virtual machines, hardware and other resources. They deliver customizable infrastructure on user request to IaaS provider. Then provider creates one or more virtual machines on the demand of the client.[2] Cloud consumers directly use IT infrastructures (processing, storage, networks and other fundamental computing resources) provided in the IaaS cloud. Virtualization is extensively used in IaaS cloud in order to integrate/decompose physical resources in an ad-hoc manner to meet growing or shrinking resource demand from cloud consumers. Notice that this strategy is different from the multi-tenancy model, which aims to transform the application software architecture so that multiple instances (from multiple cloud consumers) can run on a single application (i.e. the same logic machine). An example of IaaS is Amazon's EC2.[1] IaaS services provides by public clouds vendors such as Amazon, GoGrid, Joyent, Rightscale, Terremark, Rackspace, ElasticHosts, and Flexiscale, which has their own large datacenters and give access to their computing infrastructures as a renting bases.[2]

Fig.7 **IaaS Services** [2]

V. ADVANTAGES & DISADVANTAGES OF CLOUD

Advantages of Cloud:

- **Cost Saving:** In cloud computing users have to only pay for the services they consumed. Maintenance cost is low as user do not need to purchase the infrastructure.[4]
- **Better Performance:** In cloud computing the application are typically runs on the cloud servers. Users need not to install heavy software on their own computers of less processing speed. This will lead to increase the performance of the computer at the client side[7]
- **Flexibility:** Cloud computing is scalable. The rapid scale up and down in the operations of your business may require quick adjustment of hardware and resources so in order to manage this variations cloud computing provide flexibility.[4]
- Back-up and bring back information Once thedata is deposited in the cloud, it is calmer toget back-up and return that data using the cloud.[6]
- **Universally Availability of the Data:** By using the cloud computing services one can access their data anywhere and when required. Client simply needs to login to their cloud account where they store their data.[7]
- **Unlimited Storage Capacity:** With the help of cloud services the client can use the unlimited storage capacity provided by the cloud service provide. When the storage capacity of the client increases, he/she will simply pay a little more to use the large storage of the cloud server because the installation of large storage costs more as compared to lease the storage.[7]

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- **Reduced IT Infrastructure Cost:** Cloud services provides infrastructure as a services to the users, this will leads to reduce the installation cost for the infrastructure by paid by the client at the time of physical server establishment.[7]

Disadvantages of Cloud:

- **Requirement of Internet Connection Constantly:** To use the various services of cloud one continuously requires an internet connection. When the internet connection is down no one can use the services of the cloud offline.[7]
- Internet Connectivity In cloud computing, each facts (picture, audial, audio-visual, etc.) is stowed on the cloud, and we admittance these data concluded the cloud by means of the internet linking.[6]
- Imperfect Controller Cloud organization is entirely owned, accomplished, and checked by the provision source, so the cloud manipulators have fewer control concluded the purpose and implementation of facilities inside a cloud framework.[6]
- **Lesser Security:** The use of Public cloud often leads to lesser security as it can be accessed by the general public and there may some hackers involved in general public that can cause damage to data or misuse the data.[7]

VI. CONCLUSION

Cloud computing is a one of the most emerging technology in which users run applications in shared environment and its increasing very rapidly. The user run many applications and software on virtual environment without installing on their personal computers. Cloud computing provides advanced computing resources available on-demand, with regular updates and without the need to buy and maintain the infrastructure. Cloud Computing is a wonderful and intelligent technology in today's date. Today, IT companies shift their business over the cloud-based architecture because it provides physical infrastructure to build an application. Many people and businesses use cloud services for a number of reasons including cost savings, high performance, high computing power and security, increased productivity, and efficiency. Cloud computing has major impact on business and society.

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