A DETAILED INVESTIGATION AND ANALYSIS ON CLOUD COMPUTING

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Abstract: Cloud computing, the term Cloud refers to"Network" or "Internet". In other words, that cloud is something which is present at remote location. Cloud computing is a model of allowing convenient, on demand access from anywhere, to a shared pool of computing resources. It describes the web-based computers, resources and services that system developers can utilize to implement complex web-based system. Cloud computing is a delivery model of computing services over the internet. It manipulates and configures apps online. It provides shared computing resources applications, computing, storage, networking, development and deployment platforms as well as business processes. Cloud is highly automated, utility based.

*Keywords***: Cloud computing, deployment, computing resources, web-based system and internet.**

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I. INTRODUCTION

Cloud computing is an emerging computing technology that uses the internet and central remote servers to maintain data and application. Services and solutions that are delivered and consumed in real time over internet are cloud services. Cloud reduces the complexity of networks. By using cloud computing does not have to buy software licenses. Cloud computing is a delivery model of computing services over the internet. With cloud computing users can access database through the internet facility from anywhere for as long as they need without worrying about any maintenance or management of actual resources. Cloud computing is both a combination of software and hardware based computing resources delivered as a network services. It is easy and agile deployment. Cloud is device and location independent. It is more secure and storage management and free up internal resources. Cloud computing can provide services over internet that is on public networks or on private network.
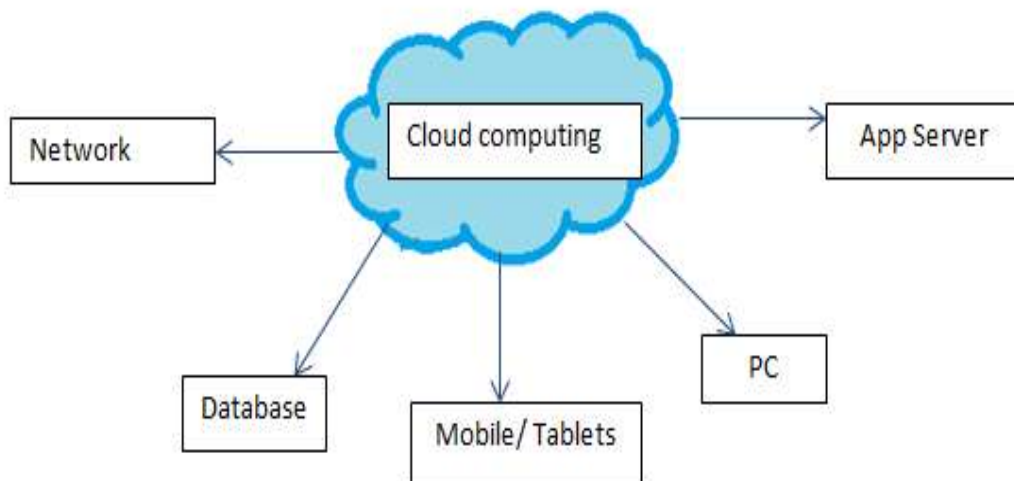
Fig.1 Cloud Computing Servers.

II. CLOUD ARCHITECTURE

Cloud based application provide a wide range of solutions to a very large number of users. To analyse and describe cloud based systems, many people refer to a cloud solution in terms of its deployment model and service model. A cloud deployment model specifies how resources within the cloud are shared; there are three cloud deployment models. Each model influences the corresponding scalability, reliability, security and cost. The deployment model defines the purpose of the cloud and nature of how the cloud is located.

2.1. DEPLOYMENT MODELS OF CLOUD COMPUTING:

There are three different ways to deploy cloud computing resources, they are

- Public cloud
- Private cloud and
- Hybrid cloud

2.1.1. Public cloud: Public cloud is operated by a third party cloud service provider which deliver their computing resource like servers and storage via the internet. Public clouds provide an elastic, cost-effective means to deploy solutions and take care of deploying, managing and security in infrastructure. With Public cloud, all hardware, software and other infrastructure is managed and owned by cloud provider. Within the Pay-as-you-use option, it is much like utility consumption [3].

2.1.2. Private cloud: A Private cloud in cloud computing resources, used by a single business or organisation. A private cloud is one in which the services and infrastructure are maintained on a private network. Private cloud offers some of the benefits of a public cloud computing environment, such as elastic on-demand capacity, self-service provisioning and service-based access. Virtualization, multi-tenancy, consistent deployment, security and access control are some of the service provided by private cloud.

2.1.3. Hybrid cloud: Hybrid clouds combine public and private clouds, bound together by technology that allows data and applications to be shared between them. By allowing data and public clouds, hybrid cloud gives business greater flexibility and more deployment [2]. This hybrid model allows pay-as-you-go pricing. In hybrid cloud, users typically outsource non-business critical information and processing to the public cloud, while keeping business critical services and data in their control. It is an intermediate step in the evolution process, providing business and current IT environment into the cloud. Hybrid cloud is particularly valuable for dynamic or highly changeable workloads. By combining private cloud and public cloud option organizations can address compliances and security issues [Fig.2].
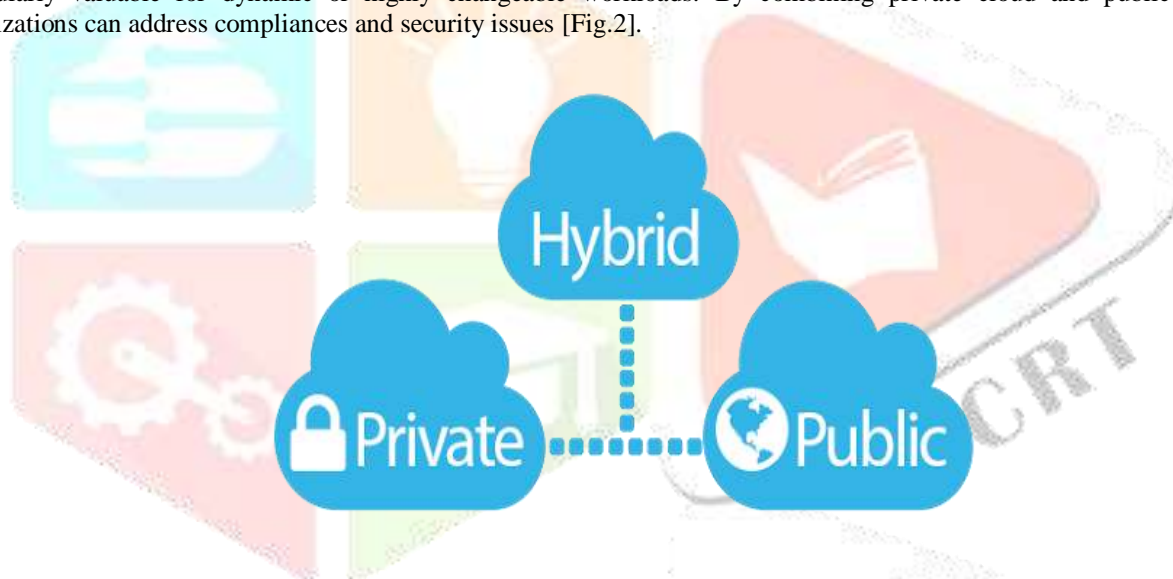

Fig.2 Public, Private and Hybrid cloud in Cloud Computing.

2.2. SERVICE MODELS OF CLOUD COMPUTING:

Service models are the reference models on which the Cloud computing is based. Service model of cloud computing is categorized into three basic models they are SAAS, PAAS and IAAS. There are called as cloud computing stack.

- Software as a Service (SAAS)
- Platform as a Service (PAAS) and
- Infrastructure as a Service (IAAS).
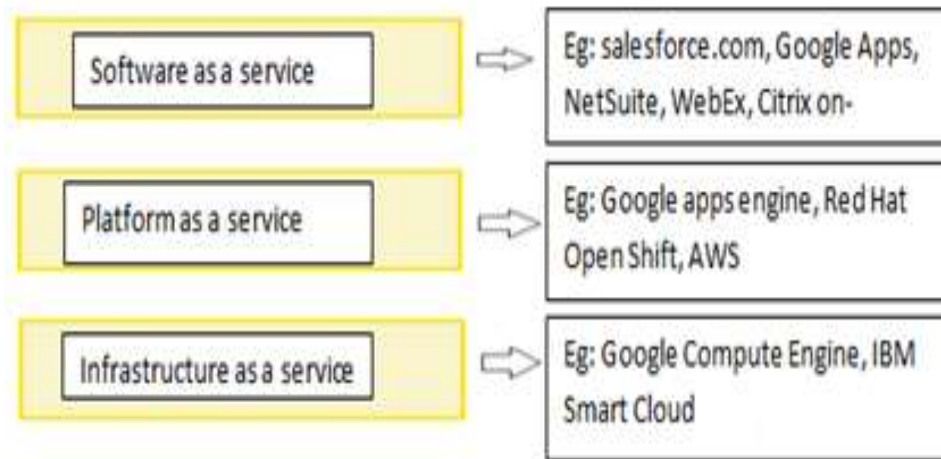
Fig.3 Service models in Cloud Computing

2.2.1. SOFTWARE AS A SERVICE (SAAS):

Software as a Service (SAAS) is a method for delivering software application over the internet. Software as a Service is a solution model in which users use a web browser to access software, along with the programs and user data in the cloud. It is the software that is deployed on a hosted service and it can be accessed globally over the internet and most in browser [1]. Software as a Service exists for a wide range of applications and provides customers with a cost effective way to get started and an affordable long term solution. Software as a Service (SAAS) provides the complete infrastructure software and solution stack as the service. SAAS reduce or eliminate the need for an on-side data centre, it offer application, processor and data storage scalability. SAAS increase disaster recovery and business continuity.For example: salesforce.com which is a CRM application as a service [Fig.3].

2.2.2PLATFORM AS A SERVICE (PAAS):

Platform as a Service (PAAS) refers to cloud computing services that refers to an on-demand environment for developing, testing, delivering and managing software applications. PAAS is designed to make it easier for developers to create web or mobile applications, without worrying about setting up or managing the underlying infrastructure of servers, storage, network and databases needed for development. Using, developers eliminate the need to buy and maintain hardware, as well as the need to install and manage operating system and database software. Depending on their needs, developers may use a windows-based PAAS solution or a Linux based PAAS. The benefits of Platform as a Service (PAAS) are lower total cost of ownership in companies, IT companies can focus on PAAS solution rather than on server related issues. Cloud based solution can scale up or down automatically based on application resource demands. So that companies pay only for the resource they consume. For example: Google Apps Engine and Red Hat Open Shift.

2.2.3. INFRASTURCTURE AS A SERVICE (IAAS):

Infrastructure as a Service is an instant computing infrastructure, provisioned and managed over the internet. Quickly scale up and down with demand and pay only for what you use. It eliminates capital expense and reduces on-going cost, and it improves business continuity and disaster recovery. Infrastructure as a Service (IAAS) is innovative rapidly, it is a cloud computing service model in which hardware is virtualized in the cloud [1]. With Infrastructure as a Service (IAAS) there is no need to maintain and upgrade software and hardware problems. It increases stability, reliability and supportability. Infrastructure as a Service (IAAS) is better security. It provides security for application and data that may be better than what can attain in-house. Infrastructure as a service provides us to develop and deliver apps, so that users get faster with it. For example: Google compute engine, Rack space services, Amazon AWS [Fig.2].

III. HOW CLOUD COMPUTING WORKS

Cloud computing services all works a little differently, depending on the provider. But many provider friendly, browser based dashboard that makes it easier for IT professionals and developers to order resources and manage their account. So Cloud computing service isdesigned to work with REST API's and a Command-line Interface (CLI), so that it gives the developers multiple options to work more easier.

3.1. World wide access- Cloud computing increases mobility so that it can access documents from any device in any part of the world, without carrying documents. It increase productivityand allows faster exchange of information. Cloud computing helps to work on documents, without staying in the same place. Cloud works in the distributed computing environment, it shares resources among users and it is not multiple it is one to one connection so it works very fast.

3.2. More storage- Cloud computing provides increased storage, so need not to worry about running out of space on hard drive.

3.3. Multi sharing- With the help of Cloud computing multiple users can work more efficiently. Cloud has very strong infrastructure it can deal with multiple users at a time.

3.4. Automatic updates- Cloud computing provider is responsible for making updates are available, but just have to download when it is available, actually this saves time and don't need to be expert to update the device. Cloud computing provider will automatically notify and it provide with instruction.

3.5. Reduced cost- Cloud computing is often in expensive. This software is already installed online, so don't need to install it. There are some cloud computing applications available for free such as Drop box, it increases the storage size and memory is affordable. Cloud computing can be paid accordingly monthly or yearly basis so that pay for the services when need them. By using Cloud computing the cost will be reduced.

IV. CLOUD STORAGE

Cloud storage is the simple way and scalable to store, access, share data over the internet. Cloud storage providers are responsible for keeping the data available and accessible, and the physical environment protected and running [2].
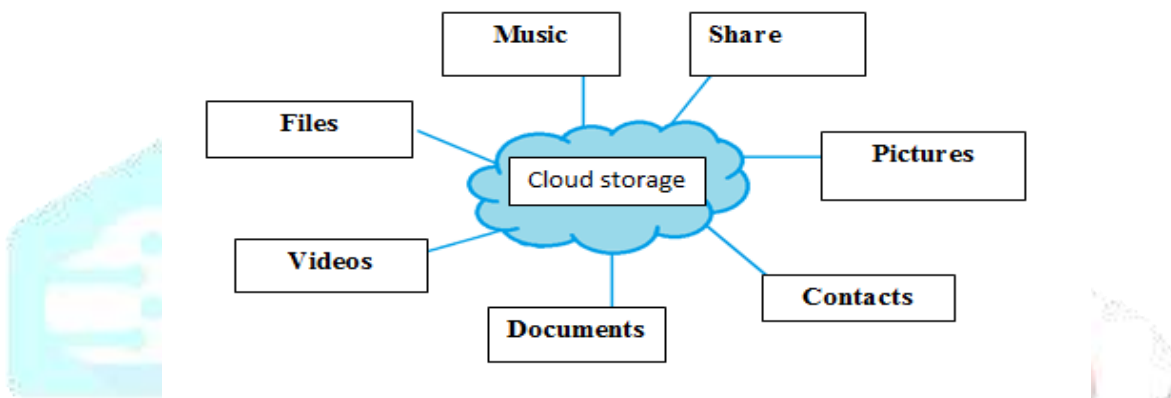
Fig.4 Cloud Storage in Cloud Computing.

Cloud storage eliminates the acquisition and management costs of buying and maintaining the storage infrastructure, increasing agility, provides global scale, and delivers "anywhere" and "anytime" to access data. Cloud storage services may be accessed through cloud computer services, a web service application programming interface (API), cloud desktop storage, cloud storage gateway. Cloud storage provides the benefits of greater accessibility, reliability, rapid deployment, strong protection for backup, archival and recovery purpose. So the cloud storage is convenient and offers more flexibility and it is more beneficial using cloud storage. There are many cloud storage devices such as Drop box, Google drive, Microsoft one drive, Cubby, Mega, SkyDrive, Amazon cloud drive etc which provide limited free online storage space for various different file types [Fig.4]. Comparing to other file backup solutions, storing the files in the cloud storage devices is safe and secure. The file stored in the cloud can be easily viewed from phone, tablet or computer that's connected to the internet. The cloud storage can ensure the file's safe by providing backup for files and they never disappear if phone gets lost or computer gets crashed. Cloud storage has become a necessity today. Much storage does not give ample of space to store data, but also provide ample of other features and bonuses [Fig.5].

Fig.5 Cloud Storage Providers.

4.1. ADVANTAGES AND DISADVANTAGES OF CLOUD STORAGE:

4.1.1.ADVANTAGES:

Cloud storage, or storage that occurs online so users can access data remotely it is very common. It's the method of storing digital data, especially for small to medium organization. It is huge advantages to both consumers and businesses.

Cost efficiency: Cloud storage eliminates the cost of using external hard drives or backups. Organization doesn't need to spend extra money. Users can see addition cost savings because it does not require internal power to store information remotely.Cloud storage there is no hardware to purchase, storage to provision. In that it can add or remove capacity on demand, quickly change performance and retention characters, only pay for store that actually use.

Recovery: One of the greatest advantages of using cloud storage is that it always has a backup solution in case something goes wrong. If something happens to the files on a computer, it always accesses the cloud and retrieve any data that is damaged or lost.

Bandwidth: It can avoid emailing files to individuals and instead of sending a web link to recipients through email.

Increased security: Most cloud security providers tend to add extra layers of security protocols. They do this in order to prevent the files and folders from either ending up in the wrong hands or from being lost.

Accessibility: With local storage, it receives access to data from a certain location. With cloud storage on the other hand, the devices can now use every day, all day, become access points. This includes tablets, smartphones, desktops, laptops and more. With these find of devices, it can able to access the data in any location with internet access.

4.1.2. DISADVANTAGES:

Dependent on Internet connection: Since cloud based solutions depend on the speed of internet, it depends on internet upload speed and download speed, having a low latency can access the data in real time.

Hard Drives: The goal of cloud based services is to minimize dependency on physical storage devices, a large no of business cloud storage services require the presence of a physical hard drive as well.

Usability: While using drop or drag to move a document into the cloud storage folder it should be very careful. So that, the file will permanently move from its original folder, from the cloud storage location. Do a copy and paste instead of drag or drop if want to retain the documents original location in addition to moving a copy onto the cloud storage folder.

Software: If want to manipulate the files locally through multiple devices, need to download the service on all devices. If no internet connection, have no access to data.

V. VIRTUALIZATION

Virtualization is the "virtual version" such as server, a desktop, a storage device, an operating system or network resources. It is a technique that allows sharing a single physical instance of a resource or an application among multiple customers and organizations. It happens by assigning a logical name to physical storage and providing a pointer to that physical resource when demanded. Virtualization allows multiple virtual machines, with heterogeneous operating system to run isolation, side-by-side on the same physical machine. It plays a very important role in the cloud computing technology. Normally in the cloud computing, users share the data that present in the cloud like application etc, but actually with the help of virtualization users shares the infrastructure. The main usage of virtualization technology is to provide the applications with the standard versions to their cloud users. By using virtualization all servers and the software application which is required by other cloud providers has to pay the money on the basis of usage. Mainly virtualization means, running multiple operating system on a single machine but sharing all the hardware resources. And it helps to provide the pool of IT resources so that it can share these IT resources in order to get benefits in the business. Hypervisor is a software layer sites between hardware and operating system which will interact with hardware and resources and provide an interface to share the available resources.

5.1. NEED OF VIRTUALIZATION IN CLOUD COMPUTING:

Virtualization is the hardware reducing, cost saving and energy saving technology that is rapidly increasing the IT landscape and fundamentally changing the way that people compute. With virtualization it is possible to run multiple operating systems and multiple applications on the same server at the same time, increasing the utilization and flexibility of hardware. Virtualization provides benefits including the energy saving and time saving, lowering the costs and minimizing the overall risk.

- Provides ability to manage resources effectively.
- Increases productivity, as it provides secure remote access.
- Provides for data loss prevention.

Fig.6. Types of Virtualization andit's process.

5.2. TYPES OF VIRTUALIZATION:

There is software that makes virtualization possible. It would be easier to understand virtualization once knowing about different types of virtualization, which are as follows [Fig.7].

- **HARDWARE VIRTUALIZATION**
- **NETWORK VIRTUALIZATION**
- **SOFTWARE VIRTUALIZATION**
- **STORAGE VIRTUALIZATION**
- **MEMORY VIRTUALIZATION**
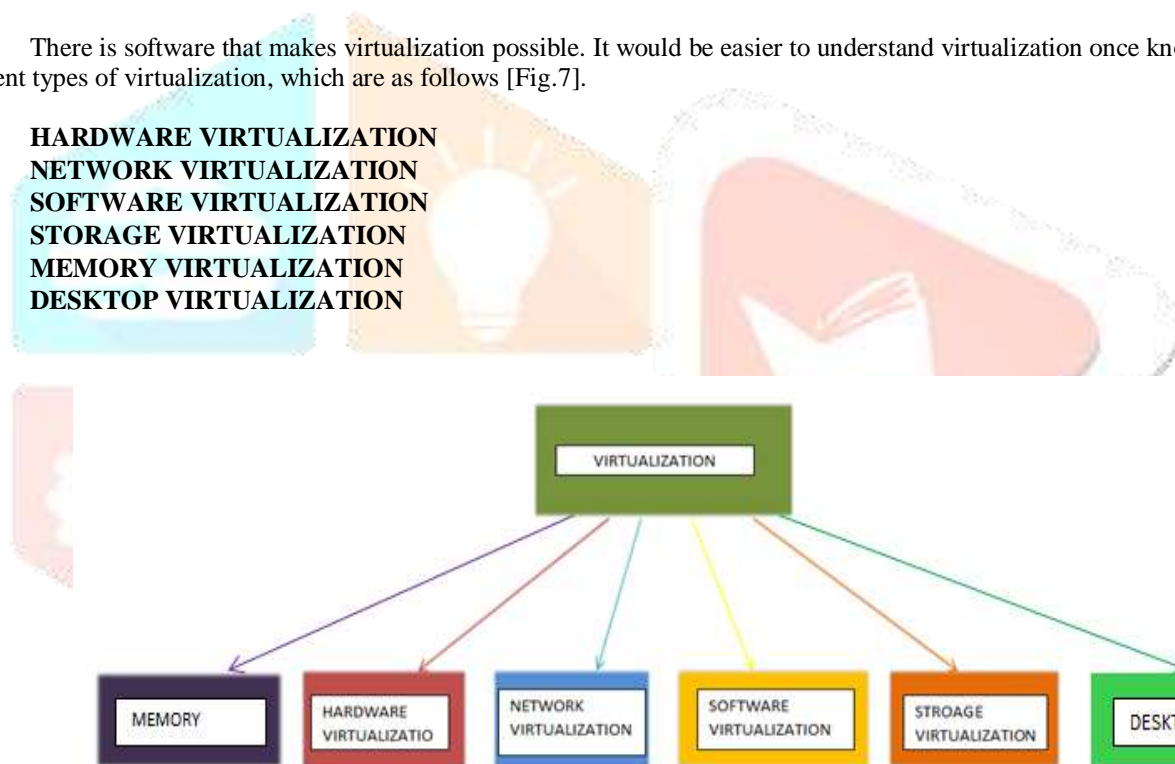- **DESKTOP VIRTUALIZATION**

Fig.7 Types of Virtualization in cloud computing

5.2.1. HARDWARE VIRTUALIZATION:

Hardware virtualization is done for server platforms, because controlling virtual machine is easier than controlling a physical server. It is most common type of virtualization as it provides advantages of hardware utilization and uptime of application. The hypervisor manages the shared physical resources of the hardware in-between the guest OS (operating system) and host OS (operating system)[Fig.6]. The advantages are,

- ✓ Lower overall costs because of server consolidation
- ✓ Increased uptime because of advanced hardware virtualization features.
- ✓ Increased IT flexibility
- ✓ More efficient resources utilization

5.2.2. NETWORK VIRTUALIZATION:

In network virtualization multiple sub networks can be created on the same physical network, which may or maynot is authorized to communicate with each other. It refers to the management and monitoring of a computer network as a single managerial entity. It is intended to allow network optimization of data transfer rates, scalability, reliability, flexibility and security [Fig.6]. The advantages are,

- ✓ It automates many network virtualizations.
- ✓ Useful for networks experiencing a huge, rapid and unpredictable increase of usage.
- ✓ Provide network like functionality to a single system.
- ✓ Combine many networks, or parts of networks into virtual unit.

5.2.3. SOFTWARE VIRTUALIZATION:

It provides the ability to the main computer to run and create one or more virtual environments. It is used to enable a complete computer system in order to allow a guest operating system to run. Software virtualization is just like a virtualization but able to abstract the software installation procedure and create virtual software installations[Fig.6]. Here are some advantages,

- ✓ Client deployments become easier
- ✓ Easy to manage
- ✓ Software migration

5.2.4. STORAGE VIRTUALIZATION:

In this Storage virtualization, multiple network storage resources are present as single storage devices for much easier and effective management of these resources. Storage virtualization is the process of grouping the physical storage from multiple network storage devices so that it looks as single storage devices[Fig.6]. It provides various advantages,

- ✓ Improved storage management
- ✓ Easy updates, better availability
- ✓ Reduced downtime
- ✓ Better storage utilization
- ✓ Automated management
- ✓ Backup recovery purpose

5.2.5. MEMORY VIRTUALIZATION:

It enhances performance by providing greater memory capacity without any addition to the main memory. That's why a portion of the disk drive serves as an extension of the main memory[Fig.6]. The implementation of memory virtualization is,
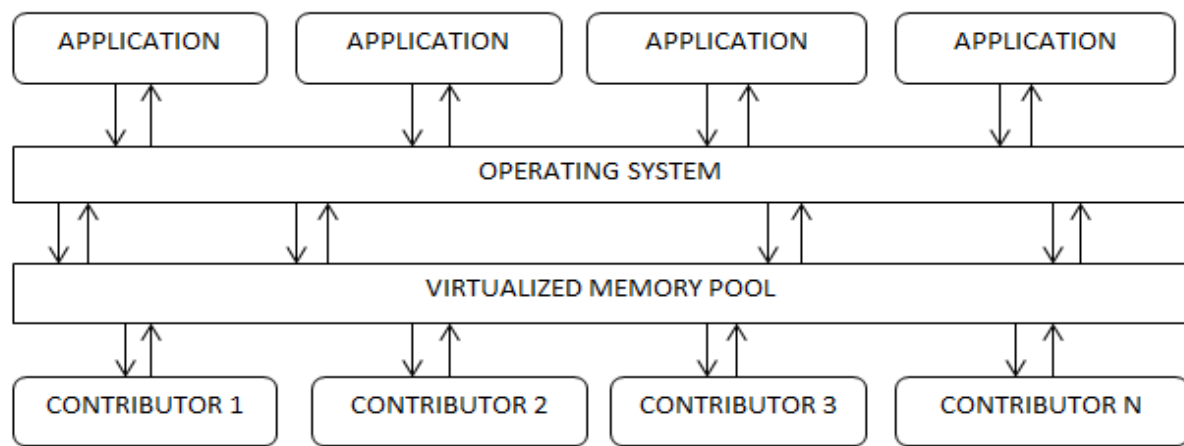
Implementations-

- ✓ Application Level Integration- Application running on connected computers directly connect to the memory pool through an API or the file system [Fig.8].
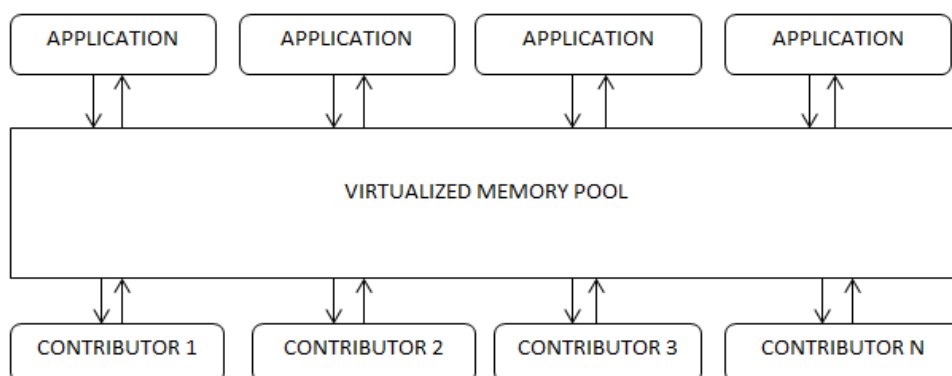
Fig.8 Application Level Integration

- ✓ Operating System Level Integration- The Operating system first connects to the memory pool, and makes that pooled memory available to applications [Fig.9].

Fig.9 Operating System Level Integration

5.2.6. DESKTOP VIRTUALIZATION:

It provides the work convenience and security. As one can access remotely, it is able to work from any location and on any PC. It provides a lot of flexibility for employees to work from home or on the go. It also protects confidential data from being lost or stolen by keeping it safe on central servers.

These are the types of virtualization in the cloud computing.

VI. CONCLUSION

Cloud computing presents a new way to consumption anddelivery model for IT services, based on developers and the internet system. Based on deployment and services various cloud computing are developed where each model servers differently to the end users. Cloud computing is changing the way to IT departments for improved flexibility for developing the delivery of soft application, platform and infrastructure as a service to IT department over the cloud computing. It is a fastest growing part of IT. Cloud computing is cost effective as setting it up does not require much more fund. It saves money spent on costly devices purchase and maintenance. The 55% of respondents believe that cloud computing has a lower Total Cost of Ownership (TCO). 39 % indicating that the cloud would make for less or more complex environments. 74% of respondents indicated that cloud computing would either lead to an increase in hiring or no impact, while rest of respondents expected any decrease in hiring based on cloud computing. Cloud computing increases profitability,by improving the resources utilization. Costs are driven down by delivering appropriate resources only for the time those resources are needed. Itprovides companies with new options for managing infrastructure and new business models. It's a much better way to spread your resources, and it becomes easier to access thing from longer distance. Cloud computing is an innovative technology that helps us to retain our data perpetually over the cloud using the internet.

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