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CLOUD COMPUTING SYSTEM

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ABSTRACT

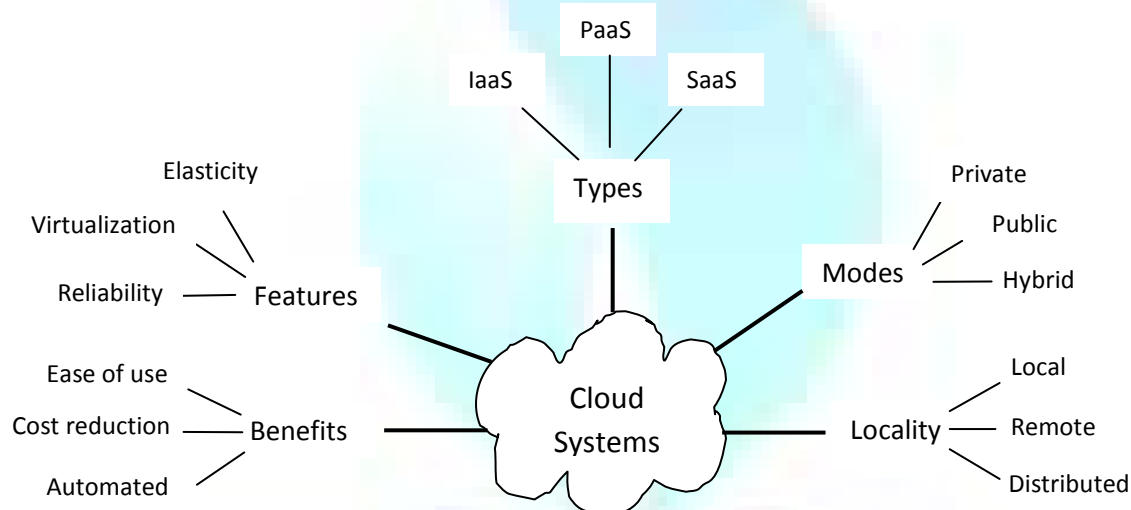
Cloud Computing is the benign way of providing Internet services and computers. Internet, Grid Computing and Web Services are such existing services on which this technology is based. This paper delves into the future perspectives in cloud computing, points out some issues of the cloud computing paradigm. It is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be swiftly rendered and released with minimal management efforts or service provider interaction. No doubt cloud computing offers vast opportunities to the IT sector, but the development of cloud computing technology is still in its earlier period, with many issues still to be addressed. It is distinguished by the notion that resources are virtual and limitless and that details of the physical systems on which software runs are abstracted from the users. The term "cloud computing" is relatively new, there is no universal agreement on this definition. This paper aims at present the future perspectives of cloud computing. It is a modality for providing computer facilities via the internet where the adjective cloud reflects the diagrammatic use of a cloud as a metaphor for the internet.

KEYWORDS

Cloud Computing, Virtualization, utility computing, cloud platform

INTRODUCTION

Cloud computing is a style of computing in which such resources are provided to internet which are virtualized and dynamically scalable. We are dwelling in the era which sees rapid development in processing and storage technologies and the success of internet. Computing resources are becoming cheaper and more ubiquitously than even before. The term cloud computing is fetched out metaphorically when some of the analysts such as Buyya and Forester see the cloud computing system as modified virtualized volumes available on internet.

FIGURE 1: MAIN ASPECTS OF CLOUD COMPUTING SYSTEM

A cloud is an elastic execution environment of resources involving multiple stakeholders and providing a metered service at multiple granularities for a specified level of quality. Cloud computing, "the next natural step in the evolution of on-demand information technology services and products" is described as a computer model that alters swift and enables with marginal effort the access, which is assembled on demand, to a common storage computing resource from a network.

"It is very difficult to give prediction about the uncertain and fluid future of the environment surrounding Cloud Computing – be it technology, its adoption structure, industry, regulatory regime."

Niels Bohr (Noble Prize in Physics : 1922)

A key element of a successful information technology is its ability to become a valuable contributor to cyber infrastructure. The main idea behind cloud computing is not a new one. Utility computing involves organizing and providing a wide range of computing – related services as public utilities. John McCarthy in the 1960s already envisioned that computing facilities will be provided to the general public like a utility^[1]. The reason behind the mingling of different concepts in cloud computing is that it is not a new technology, but rather a new paradigm congregating a set of recent technologies. Cloud computing is often compared to the following techniques which sharing concepts with it: -

- **Grid Computing** – The grid concept has a complementary but independent relationship to the concept of cloud computing. The similarities are that both aim to provide access to large computing or storage resources. Cloud computing can benefit from grid concepts by integrating standard interfaces, federation access control and distributed resource sharing.
- **Virtualization** – Cloud computing virtualizes systems by pooling and sharing resources. It refers to the rendering of virtual computing environment created through a software facility with the capability of managing several diverse computing platforms. It always enhances the working of services. It makes possible the performing of data with high density.

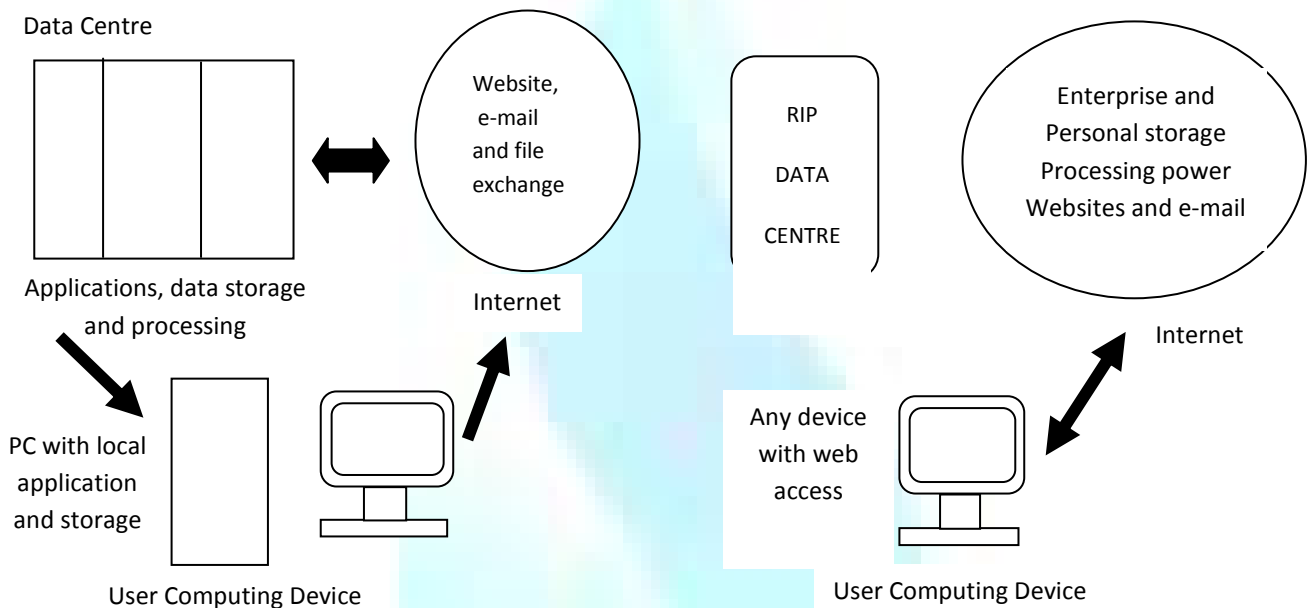
- *Utility Computing* – Computing as a utility is a dream that dates from the beginning from the computing industry. A general reference of utility computing is hosting where in an application server provides computer services on a subscription basis. A set of new technologies has come along with the need for more efficient and affordable.

CLOUD COMPUTING CHARACTERISTICS

Cloud computing is an evolutionary modification that makes a drastic new approach to how computing services are modified. Using of cloud service provider means leasing part of a huge infrastructure of datacenters, computers, storage and network capacity. There is certain difference between traditional and cloud computing. As shown in *Figure 2* at present local software is installed and data is stored on most personal computers. Most computer users in organizations also access enterprise applications, data storage and processing power from a corporate data centre. The internet may additionally be used and often relied upon. *Figure 3* shows the new stream of cloud computing where software applications and data are no longer installed and stored on a user’s computing device. Enterprise and personal applications, data storage and remote processing power are all accessed from the cloud. Both figures indicate the two most extreme positions, with a hybrid model somewhere in between being most likely in the medium-term. Even so, the implications of ceasing to install all applications and store all data on personal computers or in a data centre will be very significant [2].

FIGURE 2 – TRADITIONAL COMPUTING MODEL

FIGURE 3 – CLOUD COMPUTING MODEL



DYNAMICALLY SCALABLE

Cloud computing is dynamically scalable because users only ever have to devour the amount that they actually want. The cloud computing service can scale capacity up or down rapidly as the consumer demands at the speed of full automation, taking advantage of the elasticity of shared pools of resources. Such services appear to be unlimited in scale and can be purchased and provisioned as needed [3].

TASK CENTRIC

Cloud computing is task centric as the model which implemented for usage is dependent on the desired requirement of the user not on the infrastructure of any particular software, hardware or network. Instead of focusing on the application and what it can do, the focus is on what you need done and how the application can do it for you [4]. Cloud computing resources can be accessed from any system on the internet. Device independency will be of increasing importance as more and more people are access internet using several smart devices.

CLOUD COMPUTING ARCHITECTURE

Cloud computing is the natural extension of many of the designs and principles and it relies on a set of protocols needed to manage interprocess communications that have been developed over the last two decades. The cloud computing architecture can be divided into four layers : hardware or datacenter layer, infrastructure layer, platform layer and the application layer.

- *Hardware layer* – Physical resources of the cloud are managed by the hardware layer. It generally considers as server layer. It represents the physical hardware providing real resources for the making of cloud.
- *Infrastructure layer* – This layer is also known as the virtualization layer, the infrastructure layer creates a pool of storage and computing resources by partitioning the physical resources using virtualization technique.
- *Platform layer* – This layer, consists of operating systems and application frameworks, is built on the top of the infrastructure layer. It lessens the burden of deploying applications.
- *Application layer* – The application layer stays on the highest level and consists of the actual cloud application. In this layer applications are run and congregated with a web browser.

CLOUD TYPES

Cloud computing applications are being described as being composed of a set of layers or service types upon which distributed applications may be built or hosted. Service types are models upon which distributed applications are created and hosted.

SERVICE MODELS

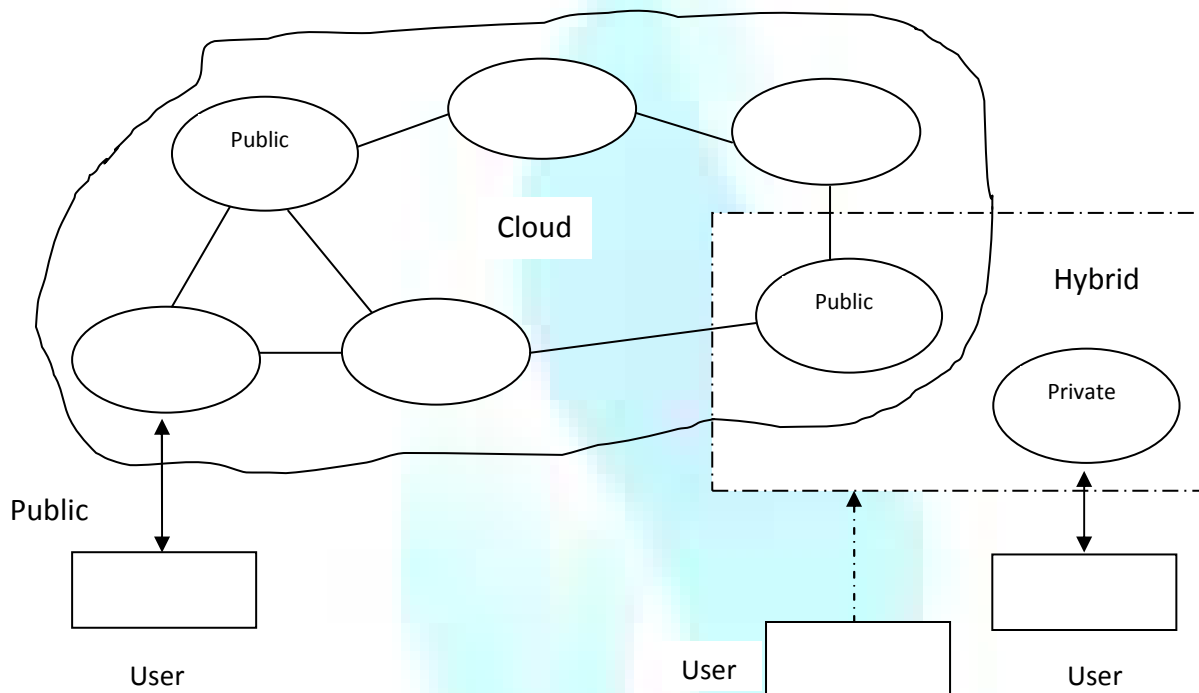
For cloud computing we generally define three major layers – the *cloud infrastructure* commonly known as Infrastructure as a Service, *cloud application platform* known as Platform as a service and *cloud application* known as Software as a Service –moving from the most foundational to the top.

- *IaaS* – Infrastructure as a Service is the foundation of cloud computing. IaaS provides virtual machine, virtual storage and virtual infrastructure and other hardware assets as resources that client can provision. This type of cloud computing provides the basic elements for IT industry. Most large IaaS providers rely on virtual machine technology to deliver servers that can run applications.
- *PaaS* – Platform as a Service is a category of cloud computing that provides a platform and environment to allow developers to build applications and services over the internet. Platform in the cloud is a software layer that is used to create higher levels of services. PaaS provides virtual machines, operating systems, applications, services, development frameworks, transactions and control structures.
- *SaaS* – Software as a Service is a software delivery method that provides access to software and its function remotely as a web based service. This term is used to describe a storage model where a business or organization rents or leases storage space from a third party provider^[5]. SaaS is a complete operating environment with applications, management and the user interface.

DEPLOYMENT MODELS

Cloud deployment models are critical aspects of the cloud computing paradigm. There are three types of cloud computing – Public Cloud, Private Cloud and Hybrid Cloud.

FIGURE 4 : THREE TYPES OF CLOUD COMPUTING



- *Public Cloud* - In the public cloud or external cloud computing resources are dynamically provisioned over the internet via web applications or web services from an off-side third party provider. It is made available to the general public or a large industry group.
- *Private Cloud* - Private cloud or internal cloud refers to cloud computing on private networks. They are built for the exclusive use of one client, providing full control over data, security and quality of service. It is operated solely for an organization.
- *Community Cloud* – The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns. It may be managed by the organizations or a third party and may exist on premise or off premise^[6].
- *Hybrid Cloud* - A hybrid cloud environment combines multiple public and private cloud models. It defines the complexity of determining how to distribute applications across both a public and private cloud. *Figure 4* elaborately defines the structure of all the types of clouds.

RECENT TRENDS & FUTURE PROSPECTS

The increasing of computing resources led to a higher demand of cloud systems making this concept becoming one of the topic research themes. Keeping a check on the beneficiality of the utilization of cloud computing is an issue that will arise interest for what lies ahead in this field.

DISTRIBUTED FILE SYSTEM

Google developed the patented distributed file system Google File System (GFS) providing efficient and reliable access to data using large clusters of commodity servers. GFS shares many of the same goals as previous distributed file systems such as performance, scalability, reliability and availability. Its design has been driven by key observation of application workloads and technological environment, both current and anticipated, which reflect a marked departure from some earlier file system design assumptions^[7]. Files are divided into chunks of 64 megabytes, and are usually appended to or read and only extremely rarely overwritten or shrunk.

MAPREDUCE

MapReduce refers to a group of programming techniques in which data is processed in sets. Built on top of Google File System, Google's MapReduce framework is the heart of the computational model for their approach to cloud computing^[8]. The main concept behind the computational model of Google is that the program code which is written by the software developer contains two different functions *map* and *reduce* to process a collection of data.

ARCHITECTURE DESIGN OF DATA CENTERS

Traditional data centers have had a relatively high degree of customization, with particular servers, mainframes, and so forth requiring careful planning. A data centre, which is home to the computation power and storage, is central to cloud computing and contains thousands of servers, switches and routers. Data centers will continue to exist, though over time the private clouds will increasingly resemble their public counterparts.

THREATS & RESEARCH CHALLENGES

Perhaps the biggest threat that emerges when a technology gains sufficient interest from enough people is that it will begin to be observed as panacea. Cloud computing vendors run very reliable networks. In the cloud, it is common to have various resources, such as machine instances, fail. Except for tightly managed Platform as a Service cloud providers, the burden of resource management is still in the hands of the user is often provided with limited or immature management tools to address these issues^[9]. Even though cloud computing has been widely used in industries; its research is still in early stage. Consequently, cloud services must be designed under assumption that they will experience frequent and open unpredictable failures. Services must recover from failures autonomously, and this implies that cloud computing platforms must offer standard, simple and fast recovery procedures^[10].

CONCLUSION

We have gone through a number of genres to cloud computing and pointed out all its aspects. Cloud Computing has recently emerged stimulating paradigm of managing services over the internet. It's rising rapidly changing the genre of information technology. It's true that current technology is not mature enough to cognize its full potentials. Extending this system should be the main concern of the service suppliers. It holds a considerable promise as a transformative technology that can change the very nature of computing specifically to business enterprise. To sum up, we can say that research and development related to cloud computing technologies forms a virtual part of the future of the internet. On the basis of ongoing research efforts and continuing advancements of computing technology, we believe that this technology hovered to have a major impact on scientific endeavors of society.

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