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Cloud Computing:From The Era Of Beginning To Present

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Abstract: **Cloud computing is now evolving like never before, with companies of all shapes and sizes adapting to this new technology. Industry experts believe that this trend will only continue to grow and develop even further in the coming few years. Cloud computing is Internet-based computing, whereby shared resources, software and information are provided to computers and other devices on-demand, like the electricity grid. The cloud computing is a culmination of numerous attempts at large scale computing with seamless access to virtually limitless resources. It is providing excellent facilities to business entrepreneurs by flexible infrastructure. In this paper we have provided better understanding of the cloud computing and focused on important research issues and developments related to Cloud Computing Technology.**

Keywords: **Cloud Computing, Mainframe computing, distributed computing, open source software, ARPANET, SmartCloud.**

I. INTRODUCTION

In an amazingly short span of a couple or so years**,** Cloud Computing has become an integral, perhaps even the most vital part of an enterprise's IT Strategy. It has helped free-up a huge chunk of the IT from the constrictions of legacy software and hardware licensing data center models, and has opened, revolutionized and to an extent democratized the way IT delivers services and how the users access information, applications and business services**.**

But with the ever increasing impact the cloud has on IT, there's also a palpable confusion about how its full value to business can be harnessed, mainly because of the continuous and rapid evolution of the cloud and its related technologies and the growing flux of vendors using portentous hyperbolic marketing speak to sell their cloud solutions.

That is why it is essential for businesses to continually monitor computing trends in order to keep updating and adapting their cloud strategies to evade expensive oversights or encash market opportunities over the coming years.

Cloud computing and storage solutions provide users and enterprises with various capabilities to store and process their data in third-party data centers. It relies on sharing of resources to achieve coherence and economies of scale, similar to a utility over a Network.

Cloud computing, or in simpler shorthand just "the cloud", also focuses on maximizing the effectiveness of the shared resources. Cloud resources are usually not only shared by multiple users but are also dynamically reallocated per demand. This can work for allocating resources to users. For example, a cloud computer facility that serves European users during European business hours with a specific application (e.g., email) may reallocate the same resources to serve North American users during North America's business hours with a different application (e.g., a web server). This approach should maximize the use of computing power thus reducing environmental damage as well since less power, air conditioning, rack space, etc. are required for a variety of functions. With cloud computing, multiple users can access a single server to retrieve and update their data without purchasing licenses for different applications.

Proponents claim that cloud computing allows companies to avoid upfront infrastructure costs, and focus on projects that differentiate their businesses instead of on infrastructure. Proponents also claim that cloud computing allows enterprises to get their applications up and running faster, with improved manageability and less maintenance, and enables IT to more rapidly adjust resources to meet fluctuating and unpredictable business demand. Cloud providers typically use a "pay as you go" model. This can lead to unexpectedly high charges if administrators do not adapt to the cloud pricing model. The present availability of high-capacity networks, low-cost computers and storage devices as well as the widespread adoption of hardware virtualization, service-oriented architecture, and autonomic and utility computing have led to a growth in cloud computing. Companies can scale up as computing needs increase and then scale down again as demands decrease.

Cloud computing is the result of evolution and adoption of existing technologies and paradigms. The goal of cloud computing is to allow users to take benefit from all of these technologies, without the need for deep knowledge about or expertise with each one of them. The cloud aims to cut costs, and helps the users focus on their core business instead of being impeded by IT obstacles.

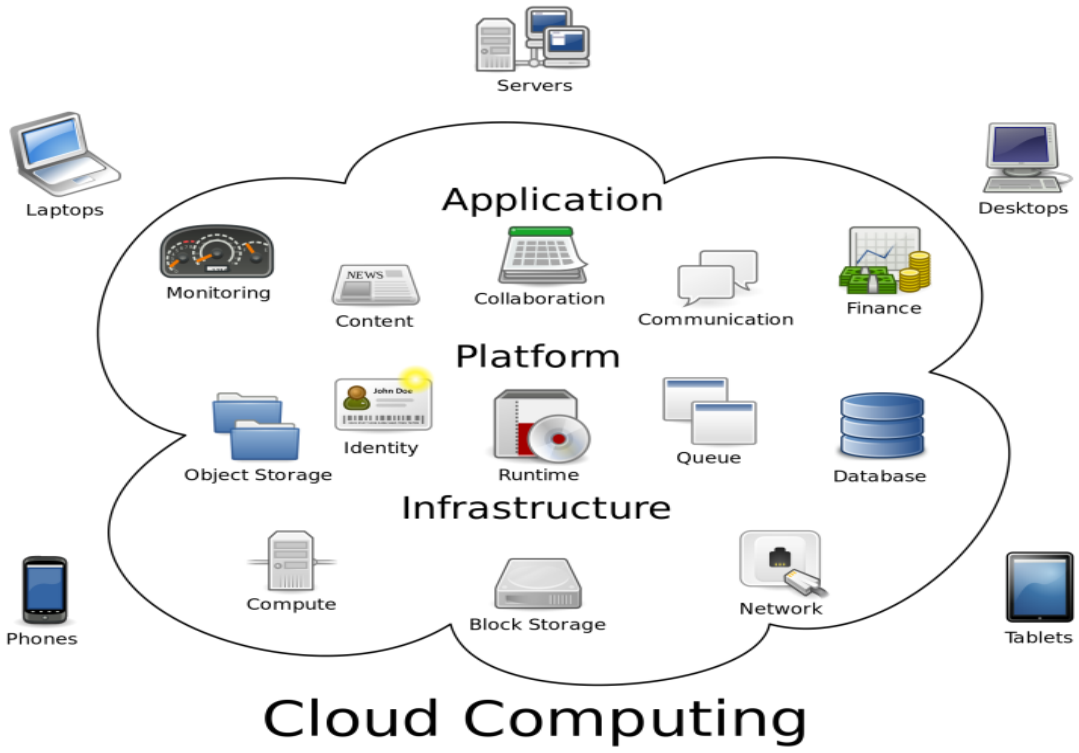

Fig-1: Basic applications of Cloud Computing

II. EVOLUTION OF CLOUD COMPUTING

The origin of the term cloud computing is unclear. The expression cloud is commonly used in science to describe a large agglomeration of objects that visually appear from a distance as a cloud and describes any set of things whose details are not inspected further in a given context. Another explanation is that the old programs to draw network schematics surrounded the icons for servers with a circle, and a cluster of servers in a network diagram had several overlapping circles, which resembled a cloud.

In analogy to above usage the word cloud was used as a metaphor for the Internet and a standardized cloud-like shape was used to denote a network on telephony schematics and later to depict the Internet in computer network diagrams. With this simplification, the implication is that the specifics of how the end points of a network are connected are not relevant for the purposes of understanding the diagram. The cloud symbol was used to represent the Internet as early as 1994, in which servers were then shown connected to, but external to, the cloud.

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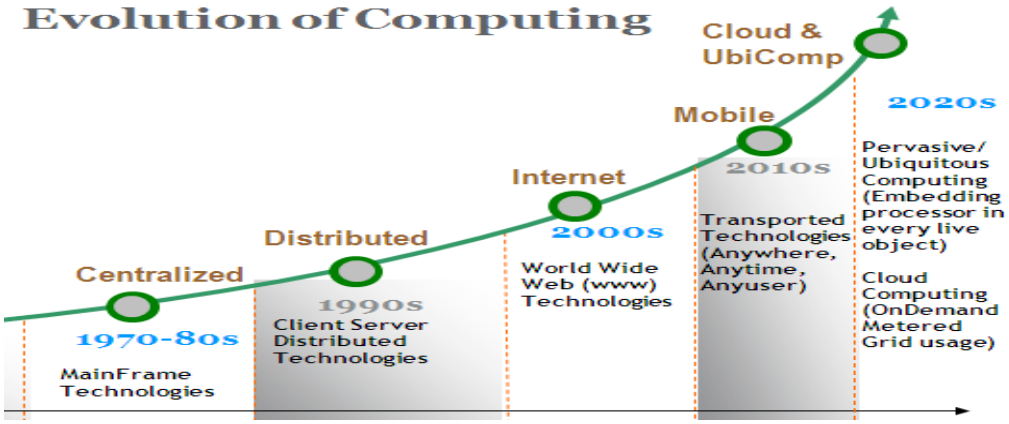

Fig-2: Evolution of Computing

Phase I: Mainframe Computing:

In the past, companies powered their information infrastructure from a mainframe. In one physical location (i.e. a building or an office), this large, powerful computer stored data and ran all the software applications. While it was relatively easy to support multiple applications through one mainframe, maintaining such a large piece of hardware was expensive and inefficient.

Phase II: Distributed Computing:

As lower cost computing became more available (enter the IBM PC in 1981) and as more people wanted access to more powerful applications, mainframe computing became less effective. The next solution for businesses was to replace the mainframe with multiple cheaper computers, each with enough computing power to store data and run applications. In a sense, this computing solution was easier to manage; whereas one bug within the mainframe could shut down every computer relying on it, each cheaper computer ran independently. However, this independence meant that the computers didn't coordinate with each other; data sharing was difficult and any resources saved were negated because each computer had to be changed/fixed/updated individually.

Phase III: Cloud Computing:

Luckily for us, today we have the cloud, which offers a slew of advantages to the computing world. As a very general definition, the cloud is a shared network of computers through which people and companies store data and run software. At its core, the cloud is a data center, a physical building with hardware (computers) and software running on that hardware, connected by pipes and routing to many, many computers. Cloud providers, who manage and maintain these networks, offer "services" rather than "products" in that, clients are allowed to access and use the cloud, but they do not "own" any part of it; there is no hardware or software installation.

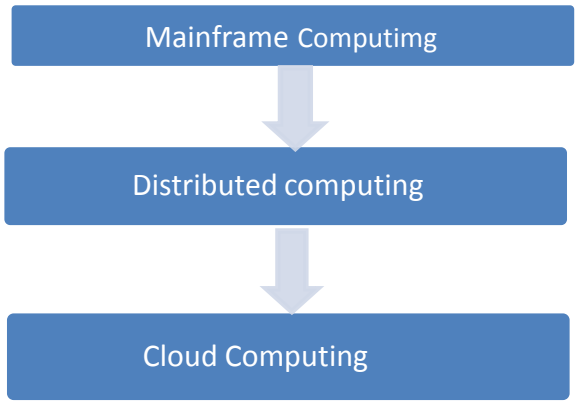

Fig-3: Evolution of Cloud Computing

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III. STAGES OF DEVELOPMENT IN CLOUD COMPUTING

MAINFRAME AND TIME SHARING- 1950'S:

The underlying concept of cloud computing dates to the 1950s, when pundits regarded large-scale mainframe computers as the future of computing, and such machines became available in academia and corporations, accessible via thin clients/terminal computers, often referred to as "dumb terminals" because though they provided better communi cations they had no internal processing capacities. To make more efficient use of costly mainframes, a practice evolved that allowed multiple users to share both the physical access to the computer from multiple terminals as well as the CPU time. This eliminated periods of inactivity on the mainframe and allowed for a greater return on the hardware investment. The practice of sharing CPU time on a mainframe became known in the data-processing industry as "time-sharing".

ARPANET-1967:

ARPANET was the network that became the basis for the Internet. Based on a concept first published in 1967, ARPANET was developed under the direction of the U.S. Advanced Research Projects Agency (ARPA). In 1969, the idea became a modest reality with the interconnection of four university computers. The initial purpose was to communicate with and share computer resources among mainly scientific users at the connected institutions. ARPANET took advantage of the new idea of sending information in small units called packets that could be routed on different paths and reconstructed at their destination. The development of the TCP/IP protocols in the 1970s made it possible to expand the size of the network, which now had become a network of networks, in an orderly way.

VIRTUAL MACHINES-1970:

Using virtualization software like VMware, it became possible to execute one or more operating systems simultaneously in an isolated environment. Complete computers (virtual) could be executed inside one physical hardware which in turn can run a completely different operating system.

The VM operating system took the 1950s' shared access mainframe to the next level, permitting multiple distinct computing environments to reside on one physical environment. Virtualization came to drive the technology, and was an important catalyst in the communication and information evolution.

VIRTUALIZED PRIVATE NETWORK CONNECTIONS-1990:

Telecommunications companies only offered single dedicated point–to-point data connections. The newly offered virtualized private network connections had the same service quality as their dedicated services at a reduced cost. Instead of building out physical infrastructure to allow for more users to have their own connections, telecommunications companies were now able to provide users with shared access to the same physical infrastructure.

PICTURES OF CLOUDS 1995:

Pictures of clouds start showing up in Network diagrams denoting anything too complicated for non-technical people to understand.

SALESFORCE.COM -1999:

One of the first milestones in cloud computing history was the arrival of Salesforce.com in 1999, which pioneered the concept of delivering enterprise applications via a simple website. The services firm paved the way for both specialist and mainstream software firms to deliver applications over the internet.

AMAZON WEB SERVICES-2002:

The next development was Amazon Web Services in 2002, which provided a suite of cloud-based services including storage, computation and even human intelligence through the Amazon Mechanical Turk.

AMAZON Elastic Compute cloud (EC2)-2006:

In 2006, Amazon launched its Elastic Compute cloud (EC2) as a commercial web service that allows small companies and individuals to rent computers on which to run their own computer applications."Amazon EC2/S3 was the first widely

accessible cloud computing infrastructure service," said Jeremy Allaire, CEO of Brightcove, which provides its SaaS online video platform to UK TV stations and newspapers.

GOOGLE APPS-2009:

Another big milestone came in 2009, as Web 2.0 hit its stride, and Google and others started to offer browser-based enterprise applications, though services such as Google Apps.

OPENSTACK-2010:

In July 2010, Rackspace Hosting and NASA jointly launched an open-source cloud-software initiative known as OpenStack. The OpenStack project intended to help organizations offer cloud-computing services running on standard hardware. The early code came from NASA's Nebula platform as well as from Rackspace's Cloud Files platform.

IBM SMART CLOUD: 2010:

On March 1, 2011, IBM announced the IBM SmartCloud framework to support Smarter Planet. Among the various components of the Smarter Computing foundation, cloud computing is a critical piece.

ORACLE CLOUD-2012:

On June 7, 2012, Oracle announced the Oracle Cloud. While aspects of the Oracle Cloud are still in development, this cloud offering is posed to be the first to provide users with access to an integrated set of IT solutions, including the Applications (SaaS), Platform (PaaS), and Infrastructure (IaaS) layers.

GOOGLE DRIVE-2012:

Google Drive is a file storage and synchronization service created by Google. It allows users to store files in the cloud, share files, and edit documents, spreadsheets, and presentations with collaborators. Google Drive encompasses Google Docs, Sheets, and Slides, an office suite that permits collaborative editing of documents, spreadsheets, presentations, drawings, forms, and more.

Google Drive was launched on April 24, 2012 and had 240 million monthly active users as of October 2014.

IBM SOFTLAYER-2013:

SoftLayer is one of the largest global providers of cloud computing infrastructure.IBM already has platforms in its portfolio that include private, public and hybrid cloud solutions. The purchase of SoftLayer guarantees an even more comprehensive infrastructure as a service (IaaS) solution. While many companies look to maintain some applications in data centers, many others are moving to public clouds. Even now, the purchase of bare metal can be modelled in commercial cloud (for example, billing by usage or put another way, physical server billing by the hour).

The result of this is that a bare metal server request with all the resources needed, and nothing more, can be delivered with a matter of hours.

CLOUD ADOPTION-PRESENT:

Cloud Adoption accelerates but continues to struggles to distinguish itself from the plain old internet.

IV. KEY FEATURES OF CLOUD COMPUTING

- **Agility**: Agility improves with user's ability to re-provision technological infrastructure resources.
- **Cost Reductions**: A public-cloud delivery model converts capital expenditure to operational expenditure. This purportedly lowers barriers to entry, as infrastructure is typically provided by a third party and does not need to be purchased for one-time or infrequent intensive computing tasks.
- **Device and local independence**: It enable users to access systems using a web browser regardless of their location or what device they use (e.g., PC, mobile phone). As infrastructure is off-site (typically provided by a third-party) and accessed via the Internet, users can connect from anywhere.

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- Maintenance : Maintenance of cloud computing applications is easier, because they do not need to be installed on each user's computer and can be accessed from different places.
- Performance : It is monitored and consistent and loosely coupled architectures are constructed using web services as the system interface.
- Productivity: It may be increased when multiple users can work on the same data simultaneously, rather than waiting for it to be saved and emailed. Time may be saved as information does not need to be re-entered when fields are matched, nor do users need to install application software upgrades to their computer.
- **Reliability:** It improves with the use of multiple redundant sites, which makes well-designed cloud computing suitable for business continuity **.**
- **Scalability and elasticity**: via dynamic ("on-demand") provisioning of resources on a fine-grained, self-service basis in near real-time**.**
- **Security**: It can improve due to centralization of data, increased security-focused resources, etc., but concerns can persist about loss of control over certain sensitive data, and the lack of security for stored kernels. Security is often as good as or better than other traditional systems, in part because providers are able to devote resources to solving security issues that many customers cannot afford to tackle.

Fig-4: Benefits of Cloud Computing

V. CONCLUSION

Cloud computing is a major development in information technology, Cloud computing is a general term for anything that involves delivering hosted services over the Internet. In this paper we have provided an easy understanding of Cloud Computing Technology and its evolution and development over the period of years. This Paper also provides features of Cloud Computing and this paper can be used for further innovations related to cloud computing.

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