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# A Review Paper on Evolution of Cloud Computing, its Approaches and Comparison with Grid Computing

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***Abstract*--Cloud computing has become an interesting topic among the IT industry, Business Intelligence and users. Cloud computing is an internet based computing which has powerful computational architecture and it offers universal services to the customers and it has several benefits over grid and other computing. It is not a location depending computing in which shared servers provides all the data, software and services to computer and some other required devices like mobile phones, PDA's etc. In this paper, we have given a review on evolution of cloud computing, its comparison with grid computing and various approaches to cloud computing.**

***Keywords*-- Cloud, SaaS, PaaS, IaaS, Cloud Computing, Grid Computing**

## I. INTRODUCTION

The term "cloud" means network of providing resources over the internet. The resources present in cloud can be used infinitely by user whenever needed. In cloud computing, customers usually preferred to third party provider for service of internet instead of setup their own physical infrastructure. Users use the resources as a service and they had to pay only for that part they had used. In cloud computing, workload is shifted so that workload can be reduced. For running applications, the local computers need not to take the heavy load. Actually the load is handled by networks of computer which forms the cloud. So, on user side the demand of hardware and software reduces. So, the required thing which needs to seen the cloud computing software on computer is only web browser, like opera, Google chrome, Mozilla Firefox etc. Features of cloud computing include on demand self services, measure services, broad network area, rapid elasticity, reduce pooling, multi-tenacity and shared infrastructure.

Cloud computing provides three different approaches. These are 1) Software as a Service (SaaS) 2) Platform as a Service (PaaS) and 3) Infrastructure as a Service (IaaS).
Customers such as general public have also readily embraced cloud computing in the form of services like Gmail, Face book, YouTube, yahoo, hotmail etc. it provides Reduction in management responsibilities and then our main concern is on production and innovation. It is more increasingly used in business which meets the need of changing environment.

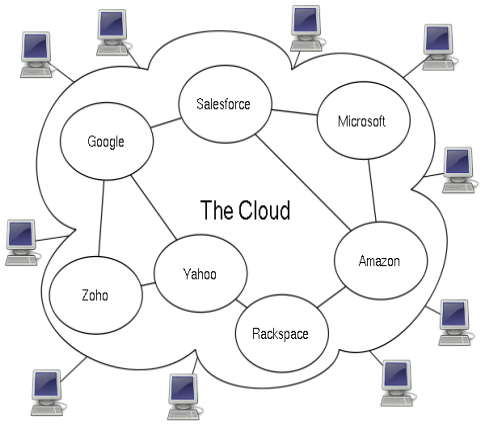


Fig 1.1: Many companies deliver services from the cloud and they are Google, Microsoft and SalesForce.com, Amazon, Yahoo etc [5]

## II. EVOLUTION OF CLOUD COMPUTING

It is contribution of some scientific research to develop a definition of the cloud computing and **Youseff et al.** were among the first person to provide understanding of cloud computing and its components. They said that cloud computing is a "combination of some new and all old concepts in a lot research fields like Service-Oriented Architectures, grid and distributed computing and also virtualization.
According to Youseff et al. "cloud computing can be considered a new computing paradigm that allows users to temporary utilize computing infrastructure over the network, supplied as a service by the cloud-provider at possibly one or more levels of abstraction" (Youseff et al. 2008).
According to Armbrust et al. "Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the datacenters that provide those services. The services themselves have long been referred to as Software as a Service (SaaS). The datacenter hardware and software is what we will call a Cloud. When a Cloud is made available in a pay-as-you-go manner to the general public, we call it a Public Cloud; the service being sold is Utility Computing. We use the term Private Cloud to refer to internal datacenters of a business or other organization, not made available to the general public. Thus, Cloud Computing is the sum of SaaS and Utility Computing, but does not include Private Clouds" (Armbrust et al. 2009).

Cloud computing is that which does not compute on local computers but on centralized computers that are handled by another organization or computed by the third party and storage utilities but this is not done in Grid Computing.

## III. DIFFERENT APPROACHES OF CLOUD COMPUTING

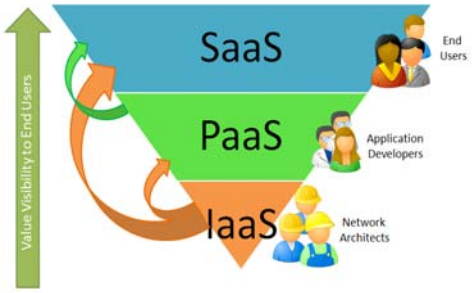


Fig 1.2 : Different approaches of cloud computing [6]

### III.1 SOFTWARE AS A SERVICE (SAAS)

Saas is available for users through internet and browsers. Saas refers to Prebuilt functionally independent, vertically, integrated and universally available applications. Example an email system, human resource management, Payroll Processing, Database processing, and other application processes delivered to and used by customer as service.

It can be divides into two models 1) Hosted application management model 2) Software on demand model

#### III.1.1 *Benefits*

I. SaaS is a broad application in which the services can be anything like online banking services, Gmail, Face book, hotmail and even from a web based email applications ton any inventory control.
II. SaaS has some products and providers which are well known .For example Microsoft office online.
III. SaaS uses some programming interface like API which provide integration between different Tools of a software.
IV. SaaS is rapidly growing Technique for delivering the technology.
V. SaaS is used in the application where there is a main interplay between the enterprise and outside world.
VI. SaaS is used in that software which is used for short term manner. Example: collaboration software for any project.

### III.2 PLATFORM AS A SERVICE (PAAS)

In Pass the platform is given to the consumers and they deploy their own software , coding and application in the cloud . It approaches to software and development tools. For example: Application server (Java, .Net framework) and Database server (My sql ,oracle) which client will use to make their own applications to meet its specific needs . It creates web applications very easily and quickly on computing platform and it reduces the complexity, cost and maintenance of software.

We can divide the PaaS as 1) Comprehensive Pass 2) Specific stack Pass 3) Proprietary Pass

#### III.2.1 *Benefits*

I. It reduces the development and maintenance cost when we develop, deploy and test any application on same integrated environment .
II. There is no need of downloading or installing for users to experience the software online. We all use website like Face book, Gmail, and yahoo etc.
III. It provides scalability, reliability and security which is in built.
IV. Proper and deep understanding of user activities.
V. Pay for use.
VI. It has shared architecture means concurrent users can access the application.

### III.3 INFRASTRUCTURE AS A SERVICE (IAAS)

IaaS provides the delivery of computing resources in form of hardware, network, storage, operating system and storage devices as on demand service. IaaS is combination of both public and private infrastructure or can be obtained as individual. For IT resources IaaS will provide a new consumption model as compare to SaaS and PaaS the IaaS is growing rapidly

#### III.3.1 *Benefits*

There are some core characteristics which describe what IaaS is and they are:- I. IaaS distribute the resources as a service. II. Dynamic scaling is allowed in IaaS.
III. In IaaS cost varies.
I. In IaaS, multiple users or customers can access on a same hardware.
II. It has full scalability.
III. No administration is needed.

**Table 1: Milestones of computer history**

| NUMBER OF YEAR | TECHNOLOGY NAME |
|---|---|
| 1623 | First calculating machine |
| 1837 | Analytical machine |
| 1885 | Electrical logic machine |
| 1890 | Tabulating machine |
| 1936 | Electrical logic machine realized |
| 1941 | Z3 |
| 1945 | ENIAC |
| 1947 | Transistor |
| 1957 | IBM 704 |
| 1964 | IBM SYSTEM/360 |
| 1964 | DEC'S minicomputer PDP-8 |
| 1969 | ARPAnet |
| 1969 | Intel microprocessor 4004 |
| 1971 | Intel microprocessor 8008 |
| 1973 | First pc miracal |
| 1973 | Tv Type writer |
| 1974 | Mark 8 |
| 1974 | Xerox's minicomputer alto |
| 1975 | Altair 8800 |
| 1981 | IBM PC |
| 1983 | TCP/IP Protocol for Arpanet |
| 1988 | Internet commercialization |
| 1989 | Worldwide web |
| 1990 | Grid computing |
| 2000 | SaaS |
| 2007 | Cloud computing |

### III.4 BUSINESS AND DEVELOPING TECHNOLOGY PLAYS A MAJOR ROLE IN RISE OF CLOUD COMPUTING

There are three major market forces that enable cloud computing and drive its adoption by computing user Organizations and by service providers:

i. IT becomes embedded in the business
ii. Shared service architecture mature
iii. Technology populism spread

## IV. COMPARATIVE STUDY OF CLOUD COMPUTING WITH GRID COMPUTING

The comparative study of cloud computing with grid computing has been described in the following table because to know the evolution of cloud computing. There were some disadvantages in the grid computing which were not able to fulfill user's requirements. Then, IT industry think about a new generation of computing, called Cloud Computing. Cloud computing overcomes the problems of grid and become an interesting topic among users and IT industry. In above table we described cloud over grid by using different parameters. From above description, we can say that cloud computing is very helpful in our daily life and become a useful concept in real world.

**TABLE 2: Comparative study of Cloud Computing with Grid Computing**

| Grid Computing | Cloud Computing |
|---|---|
| Aim: Resources are shared in collaboration manner. | Aim: Resource sharing depends upon use of service. |
| Abstraction: In this, the level of abstraction is very low. | Abstraction: level of abstraction is high |
| Scalability: The degree of scalability is low | Scalability: Scalability is high |
| Multitask: it performs multitasking. | Multitask: It also performs multitasking. |
| Transparency: Transparency is low. | Transparency: Transparency is high. |
| Security: The security in grid computing is low because it depends upon grid certificate service. | Security: The security in cloud computing is high because of virtualization. |
| Operating System: It supports any standard operating system. | Operating System: In the concept of cloud computing, multiple operating systems can run. |
| Ownership: Multiple owners can take ownership. | Ownership: Single ownership. |
| Users: Few numbers of users can use it. | Users: More numbers of users can use at same time. |
| Example: GIMPS, SETI | Example: Google, Facebook, Amazon |
| Future: Cloud Computing | Future: Next generation of Computing |

## V. FUTURE SCOPE OF CLOUD COMPUTING

As we all know, cloud computing has become an important part of our daily life. With the invention of this, the conventional view of computing has been changed. Due to the positive response of the users because of its user friendly and easy configuration techniques; the future of cloud computing seems very bright. From some organization's survey, it has been noted that in next decades 70% of Americans will use its various application for personal and official use. We all are aware of it because we all are using cloud computing in various forms like E-mail, accessing websites like Face book, Flicker etc.

The future of cloud computing is becoming bright due to: the presence of High Speed internet becoming cloud computing more important. We are getting closer because the world has been globalised due to the internet facility through satellites. The internet is connecting people from one country to another within seconds through various cloud based websites like Skype, Whats App etc. Now, airlines are also offering satellite based services in flights. The cloud computing is becoming more robust than the other technologies. In future, the cloud computing systems will be validated through centralized trust. Centralized data is the future of cloud computing. This allows companies to create huge database. Due to this, projects can be managed in huge databases.

Some points that will boost the future of cloud computing are 1) internet will boost its future 2) entertainment will be unlimited 3) hardware will optional 4) no need of software updates 5) paperless work and many more. So, we can say that the past of cloud computing is bright and future will even brighter

### V.1 *In India*

For a country like India, the importance of a technology like cloud computing is manifold as a majority of small and medium enterprises who cannot afford technology in the current form and similar to how most Indians skipped the landline to adopt the cell phone a decade back.

Accessing the different web services of e-Government by using sophisticated laptop or desktop are beyond the reach for a large number of users in a country like India. In India, 70% of the total population earn less than $2 per day and cannot afford expensive laptop or desktop etc to get the facilities of e-Governance.

A study by Nasscom and Deloitte estimates the Indian cloud computing market will reach USD 16 billion by 2020. Similarly, a report by consulting firm Zinnov Management Consulting estimates that the cloud computing market will grow from USD 400 million (currently) to USD 4.5 billion by 2015. A recent Microsoft-IDC study says that cloud computing will generate over 2 million jobs in India by 2015.

## VI. CONCLUSION

In this review paper we have discussed about the cloud computing, its characteristics, evolution and comparative study with grid computing. And then we discussed about different approaches of cloud computing and some of their advantages. As we have studied about the cloud computing and its approaches, we got to know that the study of this topic is in depth and range of application areas will continue to increase. So, we understand that the cloud computing have a major impact on society and commercial business.

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