

# CLOUD COMPUTING THE ERA OF THE DATA AND INFORMATION MANAGEMENT

Nisha Rani <sup>[1]</sup>, Kiran Ahuja <sup>[2]</sup>, Gaurav Patel <sup>[3]</sup>, Kushagra Jangid <sup>[4]</sup>

<sup>[1],[2]</sup> Assistant Professor, Arya College of Engineering & Research Centre

<sup>[3],[4]</sup> B. Tech Student, Arya College of Engineering & Research Centre, Jaipur, Rajasthan - India

## ABSTRACT

The fast-developing era of computer technology has gone through the spectacular advances in computing storage, processing capabilities and networking technology, which have allowed the users to generate, process, and share huge volume of information with high reliability and efficiency. The need for processing and distribution of huge data leads to the development of cloud computing, which enables convenient, limitless, on demand network access to a shared pool of computing resources placed at different places. Numerous users and research organizations are now applying cloud- computing concepts for easy and efficient solutions to their computing and data sharing needs. This chapter provides the detailed discussions on the architecture of cloud computing, its advantages, and various potential applications in the field of Information Technology (IT), agriculture, library and education.

**Keywords:** Cloud computing; virtualization; public cloud; private cloud; hybrid cloud; infrastructure as a service; platform as a service; hardware as a service, Cloud computing is a style of computing where adaptable and versatile information technology empowered capacities are given as an administration to numerous outside clients utilizing Internet advances.

## I. INTRODUCTION

Distributed storage is a backend as a help that gives consistent versatility and dispenses with the need to run data sets that are normally dispersed [1-3]. It is a quick, completely oversight administration planned explicitly for use on the Internet. Distributed storage has incredible constant notice works and can along these lines be utilized in internet based applications [4-6]. A host PC, which is proposed to be executed in numerous projects and to which different PCs are associated through an organization, is known as a worker. It very well may be a solitary PC or a progression of interconnected PCs [7]. Worker just requirements to give availability over an organization to different PCs. From enormous partnerships to more modest ventures, a worker has gotten critical and gives the entirety of the fundamental administrations required on an organization.

Cloud computing is an ubiquitous model where everything that is offered to a cloud client is a service and a useful computing model that provides a wide range of services to users when ordering a distributed method due to its creativity. Emerging and developing technology of wide and medium resilience [8]. As defined by the National Institute of Standards and Technology (NIST), "cloud computing" is a model that provides easy on-demand access to a shared set of dedicated computing resources (such as networks, servers, storage systems, applications, and services) [10]. It can be provided and released quickly with minimal

administrative effort or interaction with the service provider. " This cloud model supports accessibility and consists of five key features, three service models, and four implementation models [11]. The emerging cloud summarizes the complexity of heterogeneous infrastructure for servers, applications, data and platforms. "

Cloud computing [8] emphasizes the widespread use of wide area networks (WANs), the Internet, which allow interaction between cloud service providers and consumers. Service providers are expanding their offerings - from basic hardware and platforms to software services, as well as all software applications. The logical diagram [12] of the cloud computing mechanism is shown below. It consists primarily of three components: infrastructure, platform, application, and users.

In short, cloud computing is a "on-demand service" in which resources, information, software, and other shared equipment are provided in accordance with customer requirements at a specific time. It usually consists of an application, platform [13] and infrastructure. Infrastructure is distributed by nature. This distributed infrastructure is responsible for providing services upon request. Services can be from software resources (such as software as a service or SaaS), physical resources (such as platforms as a service or PaaS),

hardware (such as hardware as a service or HaaS), or infrastructure (infrastructure as a service, IAAS).



Fig 1: Cloud Computing

## II. COMPONENTS OF CLOUD

Components in the cloud relate to platforms, such as front-end and back-end cloud delivery, and a network that uses key cloud computing components in a simple topology divided into 3 (three) parts: customers, data center, and distributed servers. The three main components have specific objectives and roles in the implementation of cloud computing. The concept of the three components can be described as follows:

It is said that customers in the cloud computing architecture are exactly the same as the old and simple LANs. Usually computers just sit at your desk. But they can also be laptops, tablets, mobile phones, or PDAs, which are great engines for cloud computing because of their mobility.

Customers interact to manage their information in the cloud.



Fig 2: Components of cloud computing

A data center is a collection of servers that host your app. It can be a large basement room in your building, filled with servers around the world that you can access online. In the IT world, the trend towards virtual server. Thus, the software can be installed, allowing the use of multiple instances of virtual servers. That way, you can have half a dozen virtual servers running on a physical server.

Distributed servers are locations of servers elsewhere. However, servers are not required to be hosted on the same site. Servers are often geographically incompatible. But for you, subscribers to the cloud, these servers work as if they buzz next to each other.

Another component of cloud computing is cloud computing for cloud applications in terms of software architecture. So the user does not need to install and run applications using a computer. Cloud Platform is a computer platform service that contains hardware and software infrastructure. They typically have specific business applications and use PaaS services as an infrastructure for commercial applications. Cloud storage includes processes that provide data storage as a service. Cloud infrastructure is the provision of computer infrastructure as a service.

➤ Cloud Computing services have several components required, namely:

a. Cloud Clients, a computer or software specifically designed for the use of cloud computing based services.

Example :

- Mobile - Windows Mobile, Symbian
- Thin Client - Windows Terminal Service, CherryPal
- Thick Client - Internet Explorer, FireFox, Chrome

b. Cloud Services, products, services and solutions that are used and delivered real- time via internet media.

• The 11 main categories other of cloud computing components are as follows:

SAAS (Storage as a Service): Indicates the disk space we use when we do not have a storage platform, and therefore we require it as a service Database as a service: This component acts as a direct database from a remote server, where its functions and other functions function as if it were the physical database on the local machine. Information as a service. Information that can be accessed remotely from anywhere is called information as a service. Highlight the flexibility of remote access to information Process as a service: Unlike other components, this component combines multiple resources, such as data and services. This is mainly used in business processes, where various services and basic information are integrated to form a process.

Application as a service (AaaS). As the name implies, this package is complete to access and use applications.

This is done to connect end users to the Internet, and users often use browsers and the Internet to access this service. This component is the main interface for end users.

Platform as a service (PaaS). This component manages the entire application development process, including creating, executing, storing, and testing a database.

Integration as a service: First of all, it is related to the components of the application created, but must be integrated with other applications. This helps communicate between remote servers and local devices.

Security as a service: Because security is what most people expect in the cloud, this is an essential component. 3D security principles exist on cloud platforms.

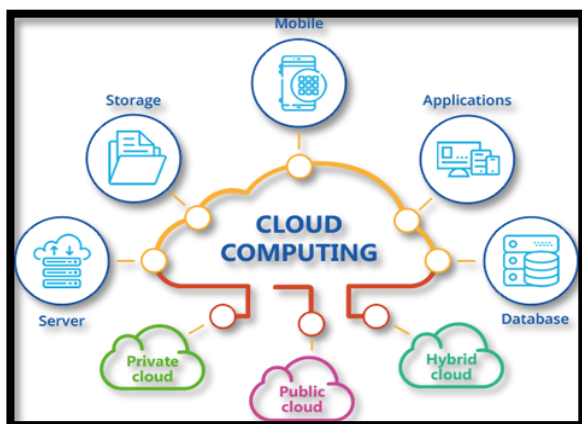
Administration / Management as a Service (MaaS and GaaS): This is related to cloud management such as resource usage, virtualization, server management and downtime.

Testing as a service (TaaS). With these components, remote hosted applications are tested in terms of design requirements, database functions, security procedures, and other testing functions.

Infrastructure as a Service (IaaS): This is the complete default solution for networks, servers, software, and hardware on cloud platforms. Users will not be able to control the background process, but will be provided with a fully configured system with all processes configured for direct use.

### III. INFRASTRUCTURE MODELS OF CLOUDS

Cloud computing infrastructure models when deployed in the cloud. First of all, cloud computing is the practice of using a server's network.



**Fig 3: Cloud Computing**

Located in the store, our processing and data management department. This is different from the local server or PC. Cloud and cloud infrastructure models now apply to all devices, as well as LikeStore software, servers and virtualization software. These components are used to support the computing requirements of the cloud computing model. There are many options, such as public, private and hybrid clouds, which begin with a standard enterprise deployment model in which the type of cloud infrastructure depends on the organization they want, on the public and private sectors, and apart from both hybrid clouds, individual interpretation temporarily stops when All these clouds are as follows:

Public Clouds: are published worldwide. Public clouds mean they are open or open to all users, and a public cloud is available to all users. Anyone can use this infrastructure to provide the client in a way to reduce risks and costs. But in the public cloud infrastructure, as a rule, all applications are mixed, so most of them are of a virtual nature. The advantage of a public cloud is that it can be enlarged, minimized or ordered, and is much larger than a private cloud. For example, most companies, such as Amazon, Microsoft, and Google, support a public cloud section that is public or public.

Private Cloud: In a private cloud, all servers, machines and resources are available or supported for a single organization or client. They cannot be used as a public cloud, deployed locally, and the private cloud provides relatively high security from the public cloud. Private Cloud provides complete control over the quality of the security and data service that is created for a single enterprise or client. This can be a cloud services manager, and its main advantage is to provide a high level of control over cloud usage.

Hybrid Cloud: A hybrid cloud is a combination of a public cloud and a private cloud. In other words, it is a combination of public or private cloud features. For example, hybrid cloud is economically viable because public cloud is economically viable, as is the case. Some important actions can also be provided by private cloud or hybrid cloud. It helps to provide external supply scope upon request.

It also determines how applications are distributed between the private and public cloud, and is effective for small data.

#### IV. LAYERS OF CLOUD COMPUTING MODEL



**Fig 4: Layers of Cloud Computing**

The cloud computing is comprised of three major layers SaaS pass and IaaS:

**IaaS** -> IaaS means infrastructure as a service. It refers to the web hosting server and hardware network equipment. The layer of cloud computing is physical hardware. The cloud is physical and without IaaS layer both PaaS and SaaS not be possible.

**PaaS**-> PaaS means platform as a service. It is the middle layer of cloud computing and it is used for the development by web developer programmer and codes for creating application program software and webtools the pass layer of the cloud is based on the IaaS layer of the cloud and it is used to build the highest layer of the cloud SaaS application.

**SaaS**-> SaaS means software-as-a-service. It is the top most layer of the cloud. It is the vast majority of consumer utilise. It can be accessible via computer tablet or Smartphone.

#### V. CLOUD COMPUTING BENEFITS

##### 1. Security issues-

Security risks of cloud computing have become the top concern in 2018 as 77% of respondents stated in the referred survey. For the longest time, the lack of resources/expertise was the number one voiced cloud challenge. In 2018 however, security inched ahead.

##### 2. Cost management and containment-

The next part of our cloud computing risks list involves costs. For the most part cloud computing can save businesses money. In the cloud, an organization can easily ramp up its processing capabilities without making large investments in new hardware. Businesses can instead access extra processing through pay-as-you-go models from public cloud providers. However, the on-demand and scalable nature of cloud computing services make it sometimes difficult to define and predict quantities and costs.

##### 3. Lack of resources/expertise-

“The success of cloud adoption and migrations comes down to your people—and the investments you make in a talent transformation program. Until you focus on the #1 bottleneck to the flow of cloud adoption, improvements made anywhere else are an illusion.”

##### 4. Governance/Control-

There are many challenges facing cloud computing and governance/control is in place number 4. Proper IT governance should ensure IT assets are implemented and used according to agreed-upon policies and procedures; ensure that these assets are properly controlled and maintained, and ensure that these assets are supporting your organization's strategy and business goals.

##### 5. Compliance-

One of the risks of cloud computing is facing today is compliance. That is an issue for anyone using backup services or cloud storage. Every time a company moves data from the internal storage to a cloud, it is faced with being compliant with industry regulations and laws. For example, healthcare organizations in the USA have to comply with HIPAA (Health Insurance Portability and Accountability Act of

1996), public retail companies have to comply with SOX (Sarbanes-Oxley Act of 2002) and PCI DSS (Payment Card Industry Data Security Standard).

#### 6. Managing multiple clouds-

Challenges facing cloud computing haven't just been concentrated in one, single cloud. The state of multi-cloud has grown exponentially in recent years. Companies are shifting or combining public and private clouds and, as mentioned earlier, tech giants like Alibaba and Amazon are leading the way.

#### 7. Performance-

When a business moves to the cloud it becomes dependent on the service providers. The next prominent challenges of moving to cloud computing expand on this partnership. Nevertheless, this partnership often provides businesses with innovative technologies they wouldn't otherwise be able to access. On the other hand, the performance of the organization's BI and other cloud-based systems is also tied to the performance of the cloud provider when it falters. When your provider is down, you are also down.

#### 8. Building a private cloud-

Although building a private cloud isn't a top priority for many organizations, for those who are likely to implement such a solution, it quickly becomes one of the main challenges facing cloud computing – private solutions should be carefully addressed.

#### 9. Segmented usage and adoption-

Most organizations did not have a robust cloud adoption strategy in place when they started to move to the cloud. Instead, ad-hoc strategies sprouted by several components. One of them was the speed of cloud adoption. Another one was the staggered expiration of data centre contracts/equipment, which led to intermittent cloud migration.

## VI. CHALLENGES OF CLOUD COMPUTING

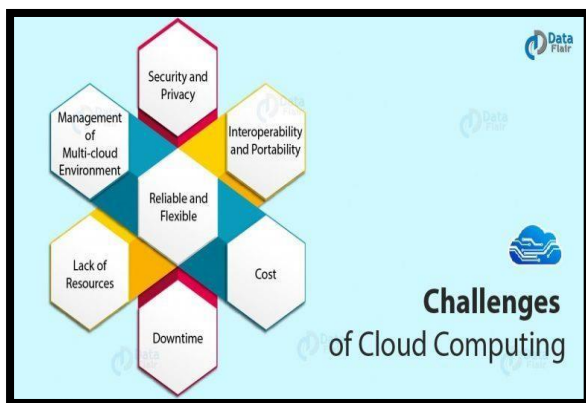


Fig 5: Challenges in Cloud

#### 1. Efficiency / cost reduction-

By using cloud infrastructure, you don't have to spend huge amounts of money on purchasing and maintaining equipment. This drastically reduces capex costs. You don't have to invest in hardware, facilities, utilities, or building out a large data centre to grow your business. You do not even need large IT teams to handle your cloud data centre operations, as you can enjoy the expertise of your cloud provider's staff.

#### 2. Data security-

One of the major concerns of every business, regardless of size and industry, is the security of its data. Data breaches and other cybercrimes can devastate a company's revenue, customer loyalty and brand positioning. Cloud offers many advanced security features that guarantee that data is securely stored and handled.

#### 3. Scalability-

Different companies have different IT needs — a large enterprise of 1000+ employees won't have the same IT requirements as a start-up. Using cloud is a great solution because it enables enterprise to efficiently and quickly scale up/down their IT departments, according to business demands.

Cloud based solutions are ideal for businesses with growing or fluctuating bandwidth demands. If your business demands increase, you can easily increase your cloud capacity without having to invest in physical infrastructure. This level of agility can give businesses using cloud computing a real advantage over competitors.

#### 4. Mobility-

Cloud computing allows mobile access to corporate data via smartphones and devices, which is a great way to ensure that no one is ever left out of the loop. Staff with busy schedules, or who live a long way away from the corporate office, can use this feature to keep instantly up-to-date with clients and co-workers.

#### 5. Disaster recovery-

Data loss is a major concern for all organizations, along with data security. Storing your data in the cloud guarantees that data is always available, even if your equipment like laptops or PCs, is damaged. Cloud-based services provide quick data recovery for all kinds of emergency scenarios — from natural disasters to power outages.

#### 6. Control-

Having control over sensitive data is vital to any company. You never know what can happen if a document gets into the wrong hands, even if it's just the hands of an untrained employee.

## VII. FUTURE APPLICATION

### 1. Increase Storage Capacity-

Today, data is generating in a high volume and it's difficult to store it with security. Most of the companies require a place where they can securely store their data. So many businesses are adopting cloud computing and it has been predicted that the Cloud providers will provide more data centres at a lower price as there is a large competition between them. With the help of the more in your company will be able to store the data.

### 2. Enhanced Performance of Internet-

With the help of the Internet of Things, the quality of the internet can be increased. With the help of the IOT and Cloud Computing, we can store data in the cloud, for further analyse & provide enhanced performance. The users expect high-quality fast-loading services and application. The network provided will be faster and the ability to receive and deliver that data will be quick.

### 3. Modular Software Will Be Priority-

The size of an individual program along with the complexity is increasing regularly. This leads to the fact that Cloud technology will soon require advance system thinking. We can see software development from many angles because in the future applications will store in places other than the cloud. This application will store on different modules, on servers of different Cloud Service.

This can also reduce the cost of software as placing components of the program on different storage is economical.

### 4. Internet of Things Along with Cloud Computing-

The internet of things is also one of the leading Technology is it comes with continuous innovation in real time Data Analytics and cloud computing. There are many machine-to-machine communication, data, and process occurring. We can do it easily with the help of cloud computing.

### 5. Data Shows How Future Changes-

The cloud computing market is growing at 22.8 percent and will exceed \$127.5 after 2018. By 2018, 62% of all CRM software will be cloud-based. Moreover, 30% of all application spending is for software as a service based applications.

### 6. Improvement in Cloud Services-

Cloud Computing includes: Infrastructure as a service platform as a service software as a service With this service, we can achieve our desired goals. There are many researchers which have proved that Cloud Computing will be one of the leading technologies in the future as the software as a service solution will account for more

than 60% of the workload. It also has been predicted that the platform as a service and infrastructure as a service will increase gradually as it has been used in most of the organizations. Cloud Computing is user-friendly and is compatible for both new as well as old organizations.

### 7. Security

The data which are stored in the cloud is secure but not fully. The small companies which are providing cloud services may or may not provide proper security to the data. So in the future, we can prevent from cyber attacks by providing better security. The cloud providers provide better security measures opening balance ways to prevent cyber attacks.

### 8. Modular Software-

Companies are using much software, which is yet to modify. This leads to the fact that cloud computing requires modified software, which will provide better security and facilities. This software will be more user-friendly and flexible to use. One of the major advantages of this software will be that it will save the overall cost as well as time [17]. We can see from the below graph, companies providing services and software are also improving.

### 9. Economic-

If cloud computing will continue to evolve the use of hardware will be less as most of the work will be done with the help of cloud computing and virtualization. We can save the setup cost of software by dividing it and this will lead to decreasing the use of hardware. If the evolution continues the data stored in the cloud will get analysed with the help of a machine and it won't require any human help.



Fig 6: Future of cloud computing

## VIII. SUMMARY OF FUTURE OF CLOUD COMPUTING

Businesses nowadays are seeking innovative ways to grow and accomplish their business goals. With the help of cloud computing, this business will keep on growing in the future. Cloud computing is powerful and expansive and will continue to grow in the future and provide many benefits. Cloud computing is extremely cost-effective and companies can use it for their growth. The future of cloud computing is bright and will provide benefits to both the host and the customer. One should keep in mind that the owner of the company should be familiar with the latest development taking place in Cloud technology.

## IX. REVIEW

The literature identifies three different broad service models for cloud computing:

(a) software as a service where applications are hosted and delivered online via a web browser offering traditional desktop functionality. For example Google Docs Gmail and MySAP. (b) Platform as a service where the cloud provides the software platform for systems. The best current example being the Google App Engine. (c) infrastructure as a service where a set of virtualized computing resources as a storage and computing capacity are hosted in the cloud.

## X. CONCLUSION

In this article a number of approaches to cloud computing are pointed out along with its architectural model. I has been seen that after so many years, cloud computing today is the beginning of “network based distribute computing” and is regarded as the technology of this decade. This paper also describes various advantages and challenges of cloud computing. In the same time various applications of cloud computing in the area of information technology, agriculture, library and education are outlined.

## REFERENCES

- [1] Swati Bhargava and Manish Mukhija, "Hide Image And Text Using LSB, DWT and RSA Based On Image Steganography", ICTACT Journal On Image And Video Processing, February 2019, Vol-09, Issue-03, pp. 1940-1946, 2019.
- [2] H. Arora, G. K. Soni, R. K. Kushwaha and P. Prasoon, "Digital Image Security Based on the Hybrid Model of Image Hiding and Encryption," IEEE 2021 6th International Conference on Communication and

Electronics Systems (ICCES), pp. 1153-1157, 2021.

- [3] Soni G.K., Arora H., Jain B., "A Novel Image Encryption Technique Using Arnold Transform and Asymmetric RSA Algorithm", International Conference on Artificial Intelligence: Advances and Applications 2019. Algorithms for Intelligent Systems. Springer, Singapore, 2020.
- [4] Ravi Khandelwal, Manish Kumar Mukhija, Satish Alaria, "Numerical Simulation and Performance Assessment of Improved Particle Swarm Optimization Based Request Scheduling in Edge Computing for IOT Applications", International Journal of Contemporary Architecture "The New ARCH" ISSN 2198-7688, pp 155-169, Vol. 8, No. 2, 2021.
- [5] Sourabh Banga, Akash Rawat, Riya Ahuja, Mohd. Zaid, Yamini Goyal, "A Brief Survey on Personal Cloud Storage using Raspberry-Pi", Design Engineering, pp. 6767- 6774, 2021.
- [6] Gaurav Kumar Soni, Sonam Gour, Mr. Kshitiz Agarwal, Aakash Sharma, Chandraveer Singh Shekhawat, Braj kishore sharma, " IOT Based Smart Agriculture Monitoring System", Design Engineering, Issue-6, pp. 2243- 2253, 2021.
- [7] G. Soni, V. Poddar, Y. Sahu and P. Suryawanshi, "Hand Gesture Recognition Based Wheel Chair Direction Control Using AVR Microcontroller", International Journal of Advanced Research in Computer and Communication Engineering, vol. 5, no. 3, pp. 344- 348, 2016. Dr. Himanshu Arora, Monika Mehra, Dr. Pramod Sharma, Jaisika Kumawat, Jyoti Jangid, "Security Issues On Cloud Computing. Design Engineering", pp. 2254- 2261, 2021.
- [8] Banga S., Arora H., Sankhla S., Sharma G., Jain B., "Performance Analysis of Hello Flood Attack in WSN", Springer Proceedings of International Conference on Communication and Computational Technologies. Algorithms for Intelligent Systems. Springer, Singapore, 2021.
- [9] Manish Mukhija, "A Resourceful Technique for virtual Machine Migration in Fog Computing", International Journal of Innovative Science and Research Technology, vol-6, issue-6, pp. 167-170, 2016.
- [10] Monika Mehra, Manish Kumar, Anjali Mourya, Charu Sharma, "MERN stack Web Development", Journal Annals of the Romanian Society for Cell Biology., pp. 11756-11761, Vol. 25, Issue 6, 2021.

- [11] Shachi Sharma, Krishna Kumar Sharma and Himanshu Arora, "A Natural Human-Machine Interaction via an Efficient Speech Recognition System", International Journal of Applied Information Systems (IJAIS), Vol-4, No.9, PP. 31-37, December 2012.
- [12] Diksha Beniwal, Manish Mukhija, "A Survey on Fuzzy logic-based approaches for Edge Detection", International Journal of Innovative Science and Research Technology Vol.1, Issue 3, pp. 23- 25, Article Digital No. IJISRT16JU07, June 2016.
- [13] N. Gosavi, S.S. Shinde, B.Dhakulkar, "Use of cloud computing in library and information science field", International Journal of Digital Library Services, (IISSN: 2250- 1142), Volume – 2, Issue – 3, July- Sep 2012.
- [14] P.K. Paul, M.K. Ghose, "Cloud Computing: Possibilities, Challenges, and opportunities with special reference to its emerging need in the academic and working area of information science", International Conference on Modelling Optimisation and Computing, ELSEVIER, 2012.
- [15] Dr. Parveen Kumar, Kiran Ahuja, Nisha Rani, Shrutika Chaturvedi, Bhawana Verma, "Machine Learning and Artificial Intelligence: In Connection with Consensus", Annals of the Romanian Society for Cell Biology, 25(6), pp. 11776– 11783, 2021.
- [16] Kiran Ahuja and Vinod Todwal, "Software Bot Detection By Keystroke Dynamics", Journal of critical reviews (JCR) ,vol. 7(19), pp. 9975-9982, 2020.
- [17] Satish, Karuturi S R V, and M Swamy Das. "Multi-Tier Authentication Scheme to Enhance Security in Cloud Computing." IJRAR (International Journal of Research and Analytical Reviews) 6, no. 2 (2019): 1-8, 2019.