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Emerging Cloud Technologies: Opportunities and Challenges

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ABSTRACT: One new technology that is becoming increasingly significant in the internet-related industry nowadays is cloud computing. It is becoming more and more well-known every day. It is among the technologies that have grown at the fastest rate in recent years. It is still in the early stages of development. Therefore, understanding the history and current state of the cloud computing concept is crucial for future study and development.

This document's goal is to present a thorough analysis of cloud computing. Topics covered in this paper include the standard definition, the development of cloud computing, and its five key components. This document also includes deployment methods, services models, and certain problems.

KEYWORDS: Definition, Evolution, Components, Characteristics, Deployment Models, Services Models.

I. INTRODUCTION

The paradigm (model) known as cloud computing offers its clients computing resources, storage, and several other services upon request via specific applications and the internet in a cost-effective way

Pay-as-you-go is the foundation of this approach. It indicates that the fee will change based on the data and resources you used, which are automatically calculated.

The National Institute of Standard and Technology (NIST) defines the cloud computing in following manner: "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."



Figure.1. Cloud Computing

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The current study is organized as follows: Section 2 provides a quick overview of the development of cloud computing. The components are explained in Section 3, and Section 4 lists the five key features of cloud computing. Information regarding the four main deployment models is provided in Section 5, service models are covered in Section 6, and some associated difficulties are addressed in Section 7. Section 8 finally concludes this study.

II. EVOLUTION OF CLOUD COMPUTING

Joseph Carl Robnett Licklider is credited with creating cloud computing in the 1960s with his work on ARPANET, which allowed people and data to be connected at any time and from any location. CompuServe gave its customers a tiny amount of disk space in 1983, which they could use to store any files they wanted to upload. Following this, AT&T introduced PersonalLink Services, an online platform for entrepreneurship and personal and professional communication, in 1994.

The significant advancement in cloud computing began in 2006 when Amazon Web applications unveiled AWS S3, a cloud storage service that has since grown in popularity and been used as a storage provider by well-known applications like Dropbox, Pinterest, and SmugMug.

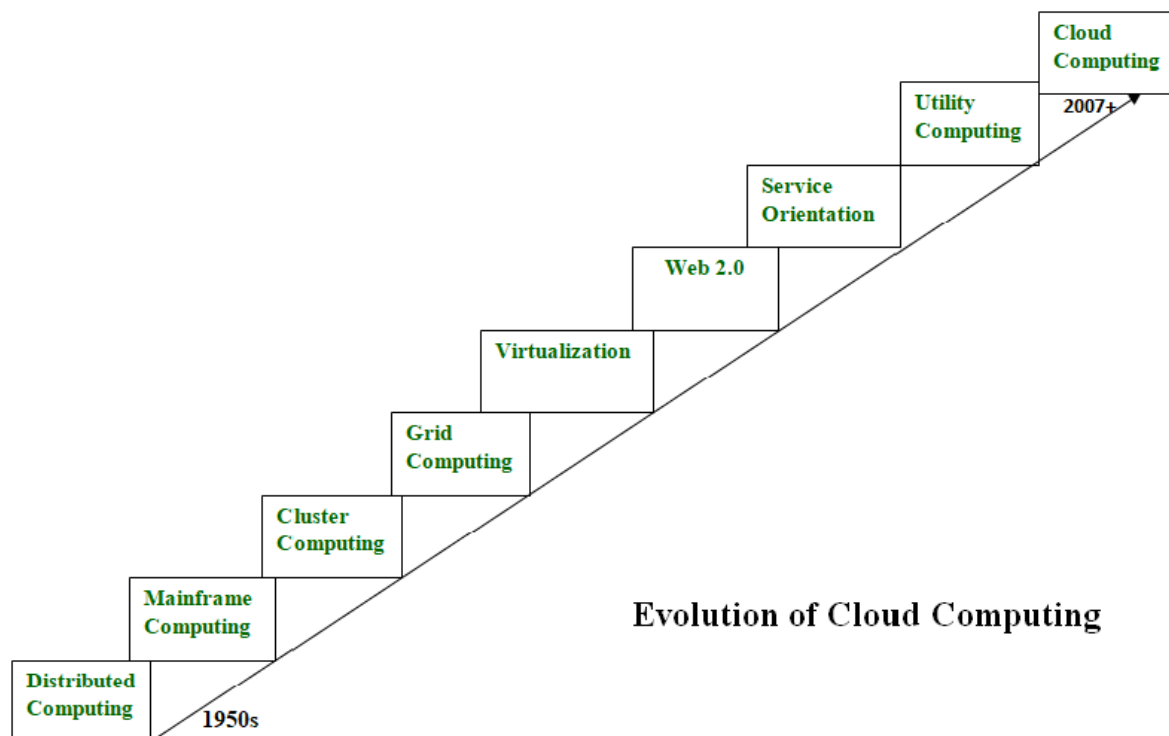


Figure.2. Evolution of cloud computing

As shown in Figure 2, the development of the cloud computing paradigm began with distributed computing and progressed to mainframe, cluster, grid, and so forth until arriving at the current state of cloud computing.

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The concept of distributed computing refers to the sharing of software system components among several computers or nodes. In order to accomplish a specific task, the systems on various networked computers coordinate and cooperate by exchanging messages. Mainframe computing is a computing paradigm that uses mainframe computers for important applications. These applications are usually bulk data processing, including financial transaction processing, industry and consumer statistics, police and secret intelligence services, enterprise resource planning, and census data. Cluster computing is the term used to describe a large number of computers working together as a single unit over a network. A node is any computer that is a part of the network. By offering improved data integrity and better computational speed, it provides answers to challenging issues. Grid computing is a type of parallel and distributed computing in which a collection of loosely coupled computers works together to do very massive tasks, creating a super and virtual information processing system.

III. CLOUD COMPUTING COMPONENTS

As shown in the provided figure 3, cloud computing is a vast paradigm that is limited by three fundamental (primary) components.

The client, data centre, and distributed server are these three fundamental parts. Together, these elements created the massive network that is now referred to as cloud computing. Each of these elements has a distinct identity and an essential function in this paradigm. The following is a discussion of the components in greater detail:

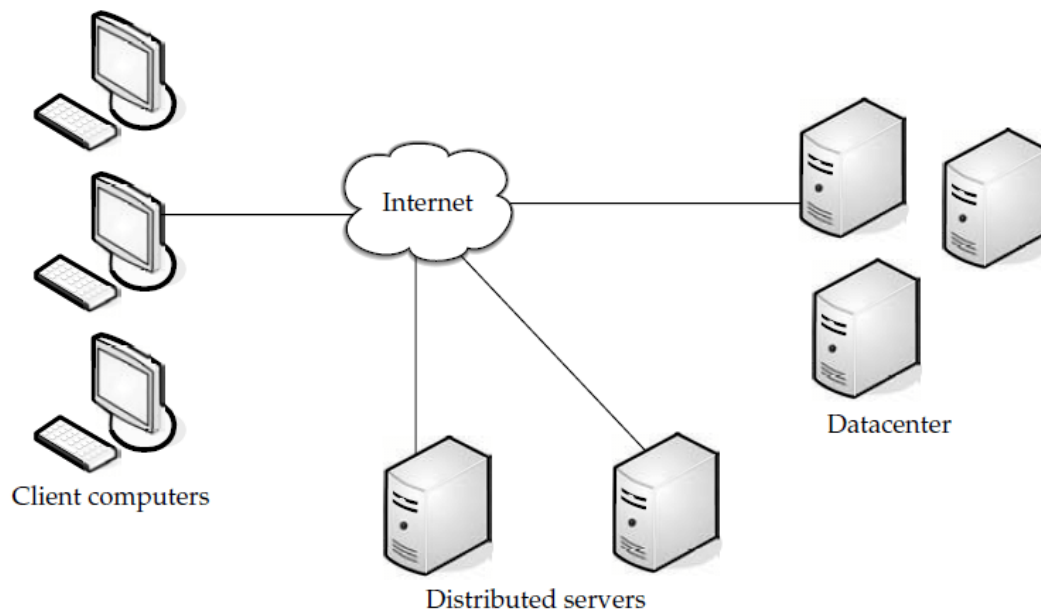


Figure.3. Components of cloud computing

Client: These are the gadgets that the end user uses to control his cloud resources; they could be desktop, laptop, iPad, smartphone, and so forth. A thin client only has to be able to run a web browser, like Google Chrome, Firefox, and others, rather than having a fast processor and large data storage. Three types of client categories could be

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distinguished: thick clients, mobile clients, and thin clients. The client's primary goal is to make materials accessible by offering a route to them via the internet.

Data center: It serves as the hub for resources and is in charge of storing and facilitating access to the necessary data. The programs that cloud computing users utilize are housed on numerous servers; they don't have to be in your home; they can be in a room or building that is reachable via the Internet. Multiple virtual machines (VMs) can operate simultaneously on a single physical server, sometimes referred to as a host; however, the quantity of VMs can be restricted by a variety of criteria, including the size of the actual server, the speed, and the type of applications running on the virtual server.

Distributed servers: Cloud computing services are not restricted to any one location. As a result, it needs dispersed servers that are positioned in a certain geographic area and are in charge of allocating the resources within that region. The servers are dispersed across several geographic locations by the cloud. The other server will take over in the event that the specific server fails; however, if an additional server is required to improve scalability, it will just be added to the current one.

IV. CLOUD COMPUTING CHARACTERISTICS

The following section discusses the five key features of cloud computing that clarify how they relate to and differ from traditional computing:

On-demand self-service: Without having to communicate directly with each service provider, a customer can autonomously provision computer resources, such as server time and network storage, as needed automatically. While "self-service" refers to offering the services without requiring human involvement, "on-demand" refers to requests. It indicates that cloud computing operates without requiring human interaction and offers its services at client request.

Broad network access: The primary goal of cloud computing is to make computing services available to as many individuals as possible so they can do their tasks more cost-effectively. It needs extensive network connection in order to offer the services to a large audience. Heterogeneous thin or thick client platforms can use it thanks to standard protocols. Mobile phones, tablets, laptops, and workstations are a few examples.

Resource pooling: The cloud computing concept is made to simultaneously offer services to a large number of users. It indicates that many users are concurrently utilizing the cloud's resources. Put differently, a multi-tenant model is used to pool the provider's computing resources to serve numerous customers, with various virtual and physical resources being dynamically assigned and reassigned in response to customer demand.

The consumer is unaware of the precise location of the resources that are offered, where the necessary data is kept. Storage, computation, memory, and network bandwidth are a few examples of resources.

Rapid elasticity: The cloud computing architecture needs to demonstrate the ability to automatically expand its capabilities in response to an increase in application load or vice versa. It contributes to offering its clients limitless resources, which boosts service efficiency because clients can use the resources in any quantity and at any time.

Measured service: Cloud computing is a vast network that necessitates expensive, reliable infrastructures and resources. Therefore, offering individuals free services is not feasible. As a result, this model of paid services offers limitless resources at a minimal cost, benefiting both the client and the provider. It is automatically measured and operates on a pay-as-you-go basis.

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V. VARIOUS CLOUD COMPUTING DEPLOYMENT MODELS

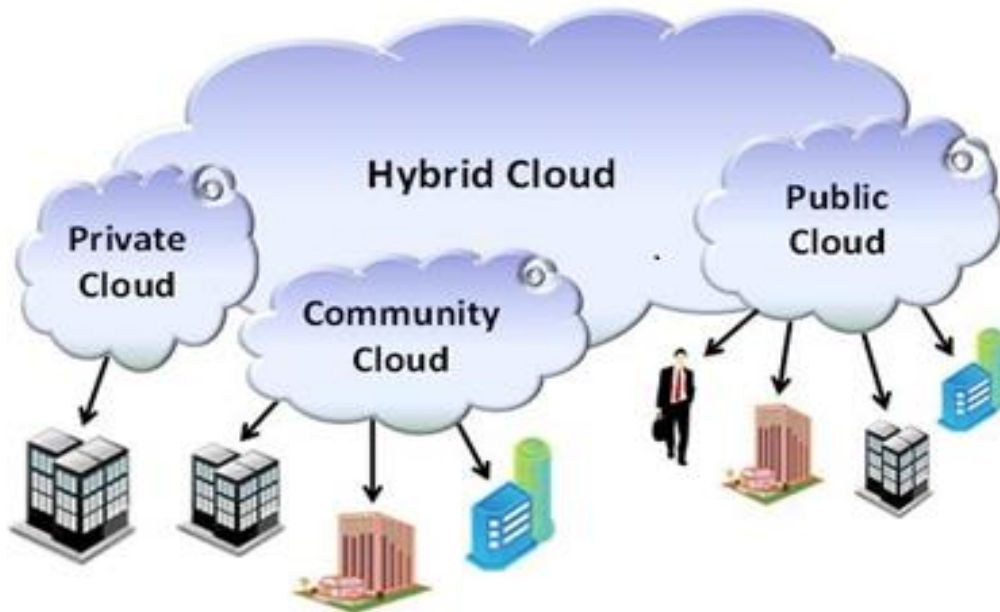


Figure.4. Deployment models of cloud computing

It enables the business to choose the location for IT infrastructure based on factors including ownership, accessibility, scale, and the type and function of the cloud. The following section discusses the four primary categories of cloud computing deployment models:

Private model: A private cloud model is a type of cloud infrastructure owned by a single organization for individual use. It is directly under the owner's control and only available to the owner or a related individual. According to the owner, the services were rendered.

Community model: The term "community" describes a particular collection of individuals. Therefore, the term "community model" refers to cloud architecture that is intended for a large number of members of a certain group to serve a variety of objectives. Only members of that particular community or that particular group have access to it.

Public cloud: A public cloud is any cloud infrastructure that is owned by a business or organization and offers payment services to anyone worldwide. The public can access it based on their needs because it is designed to offer services to the general population.

Hybrid cloud: "Hybrid" refers to the combination of two entities, as the name implies. Thus, a hybrid cloud model is a type of cloud architecture that integrates two or more cloud models to provide specific services to any organization or individual.

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VI. SERVICE MODELS OF CLOUD COMPUTING

It is a software distribution paradigm in which a cloud service provider hosts the apps and advertises them to clients online. A cloud computing system can offer network access to conventional computing resources like processing power and storage (the Infrastructure as a Service, or IaaS, service model), access to software applications like email or office productivity tools (the Software as a Service, or SaaS, service model), or an environment for users to create and run their own software (the Platform as a Service, or PaaS, service model). The various service models are appropriate for various clients and corporate goals and each has unique advantages. The following section discusses the three service models:

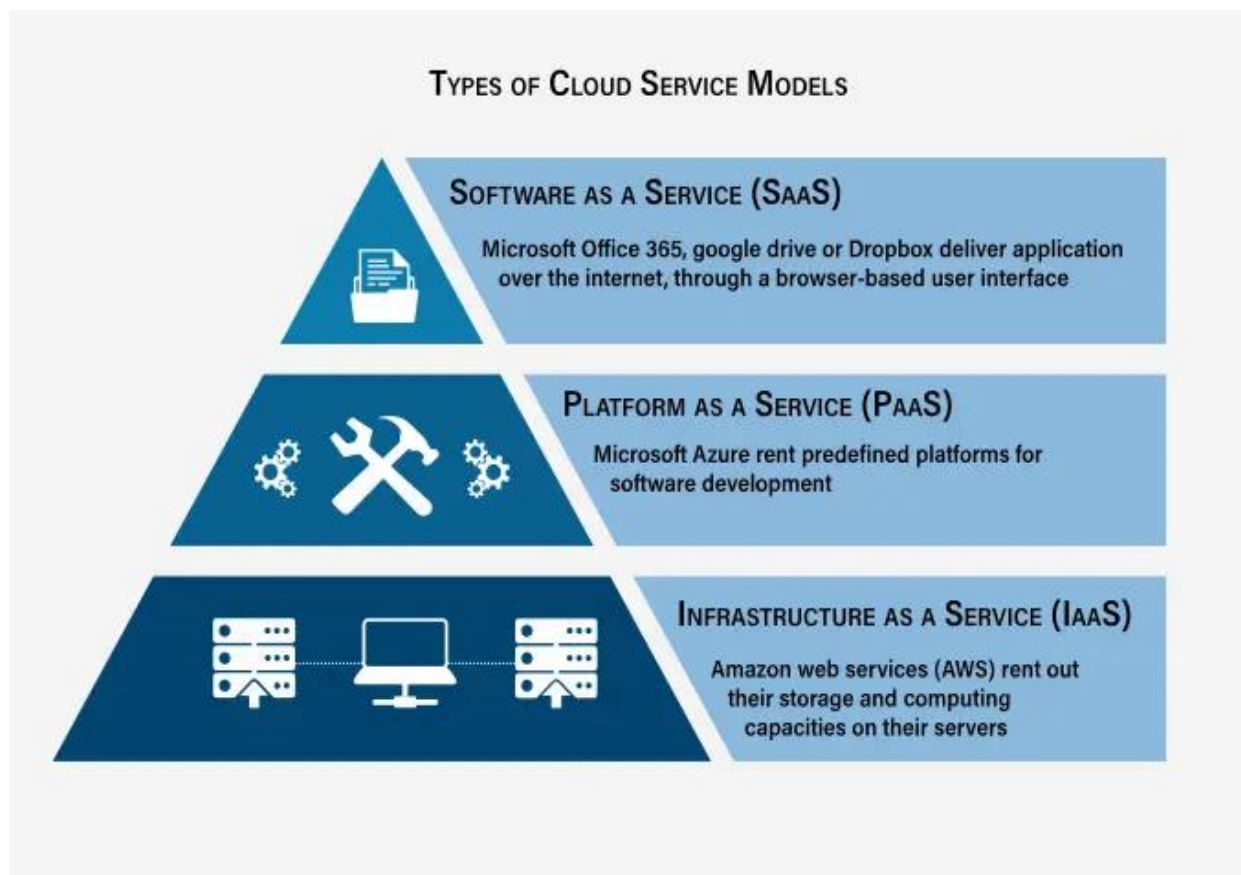


Figure.5. Cloud service models

Infrastructure as a Service (IaaS): As the name suggests, it offers clients infrastructure as a service. Data center or IT service utilization is calculated based on CPU usage per hour, storage usage, and gigabytes of data transfer. The IaaS cloud's IT infrastructures (processing, storage, networks, and other core computing resources) are immediately available to cloud users. To accommodate cloud users' increasing or decreasing resource demands, IaaS cloud offers "Virtualization," which allows real resources to be integrated or decomposed on-the-fly. Amazon's EC2 is an illustration of IaaS.

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Advantages:

- This model is most flexible and dynamic
- It is cost effective due to pay-as-you-go pricing
- It is easy to use due to the automated deployment hardware
- Management tasks are virtualized, so employees have more free time for other tasks.

Disadvantages:

- Data security issues due to multi-tenant architecture
- Vendor outages make customers unable to access their data for while.
- The need for the team training to learn how to manage new infrastructure.

Platform as a Service (PaaS): PaaS gives cloud users the opportunity to create their own cloud services and apps directly on the PaaS cloud by offering a development platform that supports the entire "Software Lifecycle". Because the providers offer the development environment and toolkit, clients who are interested in developing the application use it. It enables the developer to create the application without worrying about the processor's capabilities or the amount of memory that the application would use. Examples include Amazon AWS, Google App Engine, and others.

Advantages:

- PaaS-built software is highly scalable, available and multi-tenant, as it is cloud based
- The development process is quickened and simplified
- Reduced expenses for creating, testing and launching apps
- Automated company policy
- Reduced amount of coding required
- Allows for easy migrating to the hybrid cloud

Software-As-a-Service (SaaS): The provider allows the user to use provider's software, the software reacts with the user's interface. By using cloud technology, client only has to rent the software via the internet connection, every client in the cloud which using the same software feel that it independently belongs to him only but in the fact it is shared on the same infrastructures. By the technology of cloud, the user can use the software by either participation way or pay per use model. Examples of SaaS are Salesforce.com, Google Docs, and Google Mail.

Advantages:

- No hardware and no initial setup costs
- Automated upgrades
- Cross-device compatibility
- Accessible from any location
- Pay-as-you-go model
- Scalability and easy customization

Disadvantages

- Loss of control
- Limited range of solutions
- Connectivity is a must

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IaaS vs PaaS vs SaaS

Infrastructure as a service	Platform as a Service	Software as a Service
A service model in cloud computing that provides virtualized computing resources over the internet	A cloud computing model that delivers tools necessary for application development over the internet	A service model in cloud computing that hosts software and makes them available for clients over the internet
Provides access to resources such as virtual machines, virtual storage etc.	Provides runtime environments, development and deployment tools for applications	Provides software as services to the end users
Used by network architects	Used by developers	Used by end users

Figure.6. Comparison between various service models

VII. CHALLENGES IN PRESENT SERVICE MODELS

As is well known, cloud computing is a massive model that facilitates the handling of data and information. It must overcome numerous obstacles in order to deliver the most dependable and efficient services possible

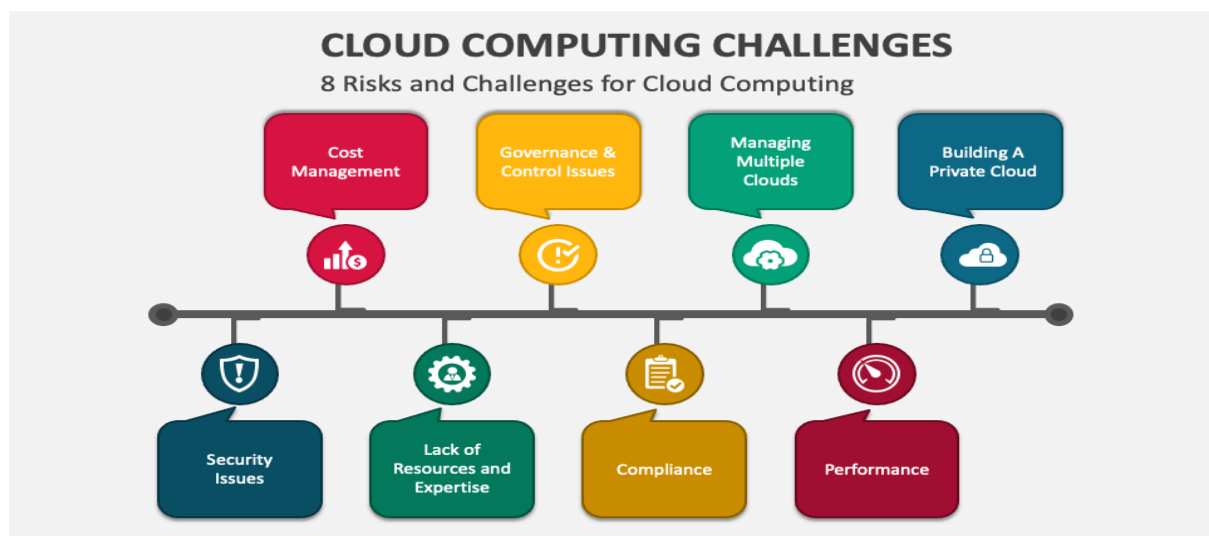


Figure.7. Challenges in cloud computing

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Out of many challenges, some are given below:

- Security and challenges: It is quite challenging to offer each and every client the finest security and privacy due to its extensive network. It is the main obstacle facing the current models of cloud computing services. Data leaks are always a possibility. By using encryption, security hardware, and security apps, this problem can be resolved.
- Portability: The ease with which apps can be moved across cloud providers presents another difficulty for cloud service models. Lock-in to a vendor must not exist. However, because every cloud provider utilizes a distinct standard language for their platform, it is not yet practicable. Therefore, if all of the cloud providers work together soon, it might be feasible.
- Interoperability: refers to the capacity of an application on one platform to integrate services from other platforms. Web services enable it, however creating these web services is difficult and full of complexities.
- Computing performance: The effectiveness of the business application you run in the cloud is dependent on how well the cloud model you are using performs. The cloud model also faces the issue of providing a highly efficient platform because there are numerous barriers that lower the service model's performance.
- Availability and dependability: A lot of individuals utilize the cloud to store their valuable data so they can quickly access it at any time and from any location. Since the majority of businesses today rely on third-party services, cloud systems must be dependable and strong.

VIII. CONCLUSION

One new technology that is gaining traction and beginning to take up a significant portion of contemporary technology is cloud computing. It will usher in a new era of technology in the near future that is considerably superior than the current one. In this essay, we looked at cloud computing and its development into modern technology. The four main deployment models—the private, communal, public, and hybrid models—as well as their fundamental features were also covered. Along with their benefits, drawbacks, and current obstacles to cloud computing, the current service models (IaaS, PaaS, and SaaS) are also discussed, which will aid in future cloud computing research and development.

REFERENCES

- [1] Cloud computing synopsis and recommendations by Lee Badger, Tim Grance, Robert Patt-Corner and Jeff Vaas. NIST special publication 8000-146.
- [2] Survey paper of cloud computing by Sparsh Verma, Dipankar Giri. ISSN 2278-0181, published by IJERT January-2022.
- [3] Cloud computing security: A survey by Issa M. khalil, Abdallah Khreishah and Mohammed Azeem. Publication at: <https://www.mdp.com/journal/computers>
- [4] Current services in cloud computing: A survey by Mohamed Magdy Mosbah, Mohamed Abou El-Nasr. Article in International Journal of Computer Science Engineering and Information Technology November 2013.
- [5] A comprehensive study on cloud computing by Md Imran Alam, Majusha Pandey and Siddhart Rautani. An article in International Journal of Information Technology and Computer Science-January 2015.
- [6] A survey on cloud computing by Qahtan M. Shallal and Mohammed Ubaidullah Bokhari publication at: <https://www.researchgate.net/publication/333039628> -May 2019.
- [7] Survey on cloud computing by Anurag Jain. An article in International Journal of Innovation in Engineering and Technology-April 2014, publication at: <https://www.researchgate.net/publication/264435521>.