Cloud Computing Characteristics and Services: A Brief Review

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Abstract

In a nutshell, this research shows how cloud computing may benefit businesses and consumers via flexible, adaptable, and affordable service delivery models. In this article, we attempt to delve into the wide-ranging services, applications, and features of cloud computing, providing several instances of cloud services provided by industry leaders like Google, Microsoft, and Amazon. We have also covered the advantages of cloud computing service models.

Key words

Cloud Computing, Virtualization, Data Recovery, Electronic Government, Service Provider are some examples of some key terms.

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I. INTRODUCTION

Computing in the cloud, or "the cloud," refers to the practice of transferring data and applications to and from remote servers rather than a local machine. Just as the Internet is a metaphor for the cloud. Typically, we use a graphical representation of the

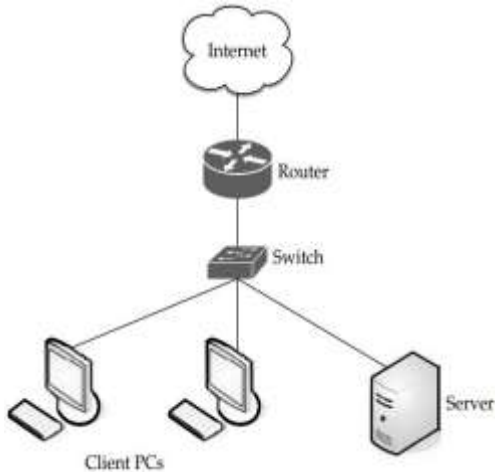Figure depicting the internet in the form of a cloud.

Fig1: Internet is depicted by a cloud in a network

Cloud computing refers to the deployment of an application and associated infrastructure through a network, most often the Internet. With cloud computing, users may access their data and run their programs from any Internet-connected device. Cloud computing service providers include Google with their Gmail product.

(As defined by the National Institute of Standards and Technology, or NIST) A paradigm for allowing pervasive, convenient, and inexpensive computing, "the cloud"
access to a shared pool of customizable computer resources (such as networks, servers, storage, applications, and services) through a network on demand, with minimum administration effort or involvement from the service provider required to supply or release the resources. There are 5 core features, 3 service types, and 4 deployment options in this cloud architecture. [1]

Cloud service providers (CSPs) like Google, Microsoft, and Amazon provide their clients access to cloud computing resources and services, which are used on-demand and in accordance with a predetermined business model [2]. Data and software programs are kept on the cloud servers, which are hosted in the data centers, and are accessible through the internet using a web browser to deliver services in many fields, including as business, education, and governance, to consumers [3].
The IT industry has made great strides thanks to cloud computing. Its introduction has greatly influenced the development of information technology. It's been crucial in meeting the rising needs for space and facilities. Cloud's unique strength is that it can provide resources like hardware and software across a network. In cloud computing, you may make use of a variety of resources on a pay-as-you-go basis. We may roughly classify the cloud into [4] categories:
Private clouds, often known as cloud computing, are used only by one company or organization.
2.Public cloudGoogle, Amazon, Microsoft, and other large companies all provide public clouds that anybody may use. Provided through the public cloud,
infrastructure and service provision for individuals or groups. Numerous individuals, maybe in the thousands, pool their resources.
First, there's the "community cloud," where services and infrastructure are made available to groups who have common interests.
Second, a hybrid cloud combines elements of both public and private clouds. Even while there is some overlap across the clouds, each one has its own identity, which is helpful for a number of different deployments.

Table 1: Comparison of Cloud Computing Service Models

Model	Scope	Managed by	Security Level
Public Model	General public and industries	Cloud service providers	Low
Private Model	Single organization	Single organization	High
Community Model	Organizations having similar policies and same security concerns	Many organizations or cloud service providers	High
Hybrid Model	Public and organization	Public and organization	Medium

Typical Cloud Hosting Companies

First, there's Google Docs, Sheets, and Slides, all of which are cloud-based services that rely on Google's online storage. In reality, the vast majority of Google's offerings (including Gmail, Calendar, Maps, Picasa, Analytics, and so on) may be categorized as cloud computing.

Second, Apple's iCloud is a cloud service for storing, backing up, and syncing your electronic correspondence, calendar, and other related data. There has been no loss of data accessibility on any platform.

Thirdly, Amazon Cloud Drive is best suited for storing music (in the form of MP3s purchased from Amazon) and pictures (with limitless space for pictures if you have Amazon Prime). Amazon Prime includes cloud storage as part of all its goods and services, making it ideal for storing any digital content purchased from the company.

I.   Using the Internet as a Server

Unlike a microprocessor or a mobile phone, cloud computing is not a stand-alone device. It's more of a system, in the mainresources. Cloud computing makes it possible for businesses to make use of services provided by independent providers. The use of cloud computing platforms in industry and academia has matured the most. Cloud computing allows businesses to save costs on the gear and software that are necessary for certain functions to execute smoothly [5].

Using cloud computing, businesses may expand their IT capabilities without spending money on new hardware, software, employees, or training.

Models for Cloud-Based Computing Services XI

The following are examples of fundamental cloud computing models:

One option is "IaaS" (Infrastructure as a Service).

Providers of cloud computing services provide various virtualized hardware and software components for use in Infrastructure as a Service (IaaS). In order to provide consumers with the ability to provide and release resources on demand, IaaS makes use of virtualization technologies [6]. Rackspace Cloud Servers, Google, Amazon Elastic Compute Cloud (EC2), IBM, and Verizon are just a few of the big organizations that provide infrastructure as a service.

A) Advantages of IaaS-Based Services

B) Users just pay for the services they use, lowering the total cost of ownership.

• Use of state-of-the-art computing facilities and hardware.Users have the freedom to increase or decrease the allocated resources as needed.

) PaaS, or "Platform as a Service"

> *This is a more complex kind of cloud computing. In Platform as a Service (PaaS), the operating system and other computer resources are made available, operated, and maintained by the cloud service provider. The services provided by a PaaS provider include all stages of an app's lifecycle. Services such as web service integration, scalability, database integration, and teamwork are also available. Users are relieved of the burden of acquiring and maintaining their own gear and software, or of hiring specialists in this area. With this method, you may choose which programs to install on your machine, and the PaaS is also scalable. PaaS's lack of interoperability and portability is a major drawback.*

including "platform as a service," "software as a service," and "infrastructure as a service," or IaaS, SaaS, and PaaS, respectively.
Companies in the computer industry increasingly rely on cloud computing to access IT resources including servers, storage, software, and hardware.

Customers may install their own apps and software in the cloud by purchasing access to the platforms. Rackspace Cloud Sites, Salesforce.com's Force.com, Google App Engine, and Microsoft Azure are all examples of PaaS platforms.

Community Benefits of PaaS Solutions - Cloud application development in PaaS settings often involves a team effort. Your development team will benefit from the strong community that is formed as a result of this.

Companies are no longer obligated to modernize their underlying IT systems. Instead, the PaaS provider is in charge of any and all software updates, fixes, and regular maintenance.

The upfront costs of hardware and software are avoided, reducing the financial risk for businesses. Deployment is simplified since the team can focus on building the cloud app rather than the testing and deployment infrastructure.

C) Service-based software delivery (SaaS)

In this setup, cloud service providers are in charge of managing infrastructure and tools including operating systems and application software. When it comes to the user experience, the SaaS model looks like any other web-based application interface where services are delivered over the internet and accessible using a web browser. Devices such as smartphones, computers, and tablets may all access the hosted apps like Gmail and Google Docs. SaaS is preferable to conventional software since the user is relieved of the burden of software ownership and management. In addition to these benefits, it is also multitenant efficient, highly configurable, and scalable [8].

Benefits of SaaS Solutions
- Rapid Scalability
- Accessibility from any location with Internet
- Eliminates infrastructure concerns
- Custom levels of service offerings
- Bundled maintenance and Support

"RaaS" stands for "Recovery as a Service."

*Companies may replace their backup, archiving, disaster recovery, and business continuity solutions with a single, unified platform provided by Recovery as a Service (RaaS) providers. Data centers, servers (including operating system, applications, configuration, and data), and database files may all be recovered with the assistance of RaaS providers.*Businesses may lessen the blow of interruptions caused by natural catastrophes and other similar events with the use of RaaS. RaaS is also known as DRaaS (Disaster Recovery as a Service) and is offered by a variety of businesses such as WindStream Business and Geminare, among many others.

Advantages of RaaS Solutions • Protecting vital business information against accidental or malicious deletion.
Prevents irreparable damage to the physical and digital infrastructure.
• Allows for speedier recovery without sacrificing accuracy; • Reduces the overall cost of data recovery.
• Provide more options for the backup strategy (primary vs. secondary).

Cloud services may help businesses save money and increase productivity. Different businesses may embrace different cloud services, business processes, and areas of expertise based on their own unique goals. Any IT project considering migrating to cloud services should first engage in thorough planning and preparation.
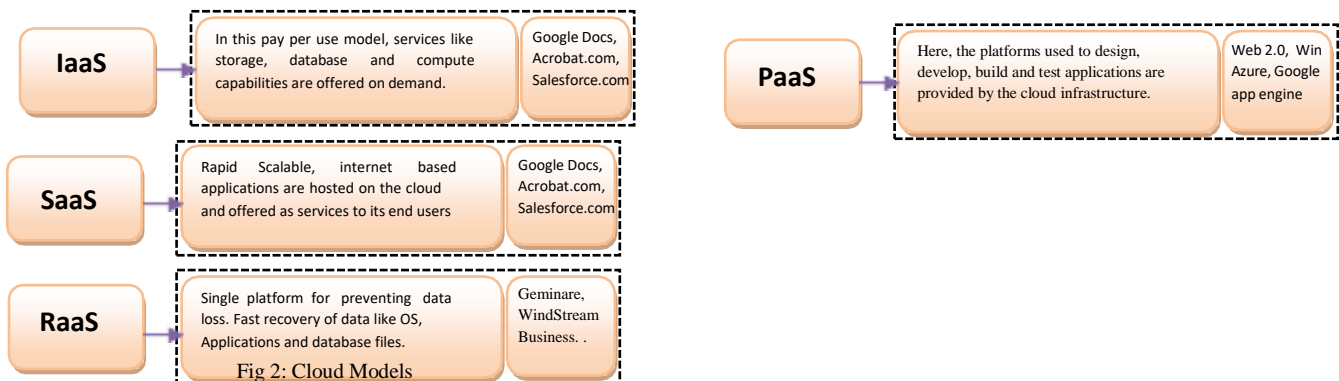
IaaS	In this pay per use model, services like storage, database and compute capabilities are offered on demand.	Google Docs, Acrobat.com, Salesforce.com
SaaS	Rapid Scalable, internet based applications are hosted on the cloud and offered as services to its end users	Google Docs, Acrobat.com, Salesforce.com
RaaS	Single platform for preventing data loss. Fast recovery of data like OS, Applications and database files.	Geminare, WindStream Business. .
PaaS	Here, the platforms used to design, develop, build and test applications are provided by the cloud infrastructure.	Web 2.0, Win Azure, Google app engine

Fig 2: Cloud Models

XI. TRAITS THAT MAKE CLOUD COMPUTING UNIQUE Several intriguing features of cloud computing systems bode well for the development of future information technology programs and services. We outline the five defining features of cloud computing systems as specified by the National Institute of Standards and Technology (NIST) [9]:

Services in the cloud, such as computing, storage, networking, server time, web applications, etc., may be made available on demand with little to no intervention from the provider.

The cloud service companies' offerings are low-priced, if not entirely free. Pay as you go eliminates the need to invest upfront in costly infrastructure while also reducing ongoing operational expenses.

• Widespread Network Access (mobility): users may access cloud resources through the Internet anytime, anyplace, and from any device (including smartphones, computers, and personal digital assistants).

- The cloud combines both real-world and digital computer resources, a feature known as "resource pooling." The consumer has no say in or access to the specific location of these resources, hence location is irrelevant.
- • Fast Elasticity: Computing resources may be allocated and released quickly and flexibly in response to user demand. Thegeneral public thinks they may buy an unlimited supply of these materials at any moment.
- The CSPs of "Measured Services" employ a pay-as-you-go approach to keep tabs on, manage, and improve the performance of their customers' cloud-based resources and services. Customers use these services in a manner comparable to their use of traditional utilities like power, water, and gas. [15, 16] Additional features of cloud computing include:
- Multitenancy: a cloud may serve several customers at once. Each user is completely autonomous inside his own personalized virtual application instance while nevertheless using the same network, host, and application resources available in the cloud.

- Cloud computing's infrastructure is very scalable, so it can accommodate growing businesses. Adding more nodes and servers to the cloud only requires minimal adjustments to the cloud's underlying architecture and software.
- Using many redundant locations is how cloud computing ensures reliability. The cloud's high availability makes it ideal for disaster recovery and other mission-critical operations.

• Scale economies: clouds are designed to be as big as possible so that users may benefit from economies of scale. Locational factors are also taken into account, with the cloud being situated near low-cost power plants and in low-cost real estate.

> • Adaptability to individual needs: the cloud's infrastructure and software may be tailored to each user's specific requirements.
> Effective usage of resources is achieved by providing them for exactly the time period required.

• Service portability thanks to virtualization: users may access their cloud-based applications from any device. Instead than relying on a physical server, it uses cloud resources. With a laptop or mobile phone and access to the internet, you can do anything. In a simple and secure manner, users may get it or share it whenever and wherever they choose. Users can do what would take many computers to do individually.

. CLOUD COMPUTING USE CASES

Since cloud computing makes it simple to pool and organize online resources, it has quickly become one of the most important computer paradigms. As a result, the following sectors benefit greatly from cloud computing:

Using cloud computing, the government may streamline its operations. This way, the different government agencies may supply their services in a more refined and efficient manner. With cloud computing, you won't have to worry about keeping your software up to date or managing installations.

ERP stands for "enterprise resource planning."

> *Cloud-based enterprise resource planning (ERP) systems are becoming more common as businesses expand. Application, human resource, and payroll administration become high-priced and time-consuming tasks. ERP may be installed on the cloud, allowing service providers to circumvent these issues.*

Table 2: Different applications of cloud computing.

Application	Service Delivered
E-Learning	E-mail, simulation tools, files broadcasting, class recording, virtual classrooms, virtual labs, surveys, education forums etc.

E-governance	Complaint resolution system, employee management system, E-police, E-Tendering, E-court, payment and tax system, agriculture and food, industry and energy etc.
ERP Cloud	Supply chain and vendor, project and HR Management, customer Relationship management, finance and accounting etc.

XIX. PROBLEMS IN THE CLOUD

Concerns about cloud computing persist despite the technology's increasing use. Some such difficulties include:

1) Privacy & Security

Information security is an issue that must constantly be prioritized. When it comes to protecting their company's sensitive information, businesses are hesitant to pay for vendor guarantees. The worry

losing data to other companies or having consumers' information stolen. Organizational security is already an issue since the real storage location is often not revealed. In the current setup, this kind of sensitive data is guarded by firewalls between various data centers that are controlled by corporations. Businesses using the cloud model must depend heavily on the security measures taken by the service providers.

- *A) Easily Accessible and Recoverable Data*
- *There are Service level agreements (SLA) in place for every corporate software. Service level agreements and application runtime governance are two areas where operational teams play a crucial role in management. Operations staff assist with the following in "live" settings:*
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• Duplicating Data

System monitoring (Transactions monitoring, Logs monitoring, etc.) • Appropriate clustering and Fail over

• Contingency planning

Maintenance (Runtime Governance) Capacity/Performance Management

If a cloud service fails to adequately fulfill any of the aforementioned features, a catastrophic loss of data may result.

B) Capacity for Effective Management

Despite the proliferation of cloud services, infrastructure and platform management have only just begun to mature. Many businesses need advanced capabilities like dynamic scalability and resource allocation. The current scalability and load balancing options have a lot of room for development.

B) Restrictions Due to Regulation and Compliance

Some European governments prohibit the storage of private information about its citizens in data centers situated in other states or countries. In order to accommodate such demands, cloud services must establish a data center or storage location inside the nation. It is difficult for cloud service providers to constantly have such an infrastructure in place.

With cloud computing, the interface between service providers and various groups of service users becomes the new center of attention. Many businesses are only somewhat prepared to deal with the complexities of cloud services, which need knowledge of dispersed services, procurement, risk assessment, and service negotiation.SUMMARY AND FUTURE STUDIES**. .SUMMARY AND FUTURE STUDIES;**

The Cloud's many potential and fascinating properties, services, and applications allow for the provision of a wide range of services and applications. In this paper, we dove into some of these features, offerings, and uses; we anticipate that many more will follow. Many businesses and people from a wide range of fields are likely to use cloud services and apps; our research provides insight into how these services will affect their operations. The largest barrier to widespread use of cloud computing is security and privacy concerns. Future cloud computing research will undoubtedly concentrate on finding new ways to fix the security problems it now has. With our future research, we want to present a framework and security model to deal with cloud computing's security issues and reduce the dangers that come with using this technology.

II.

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