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An Analysis of Cloud Computing, a New Computing Model

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ABSTRACT

As an approach to hosting and delivering IT resources and services over the internet, "the cloud" is focused on providing dependable, secure, fault-tolerant, sustainable, and scalable systems for hosting and delivering application services over the internet. Businesses find cloud computing appealing because it enables them to start small and scale up as needed in response to an increase in service demand without requiring customers to make advance preparations for provisioning. The purpose of this article is to provide an overview of cloud computing, including its history, service model, and current security challenges.

Keywords: Cloud computing, Architecture, Deployment Models, Benefits, Security issues

INTRODUCTION

With cloud computing, you may access a variety of services, including hardware, software, and operating systems, on-demand and on a pay-as-you-go basis over the internet. Telecommunications corporations have been using the idea behind this new development since the 1960s, first with point-to-point data connections, and subsequently with virtual private networks, starting in the 1990s. However, cloud computing was used for both servers and infrastructure in order to reduce the wasteful use of network bandwidth. Amazon's contribution in creating state-of-the-art data centres was important in the evolution of cloud computing. Google, IBM, and other top institutions began using it in 2007. Additionally, Gartner (2008) highlighted its qualities for both customers and service providers [1].

Consumers may enjoy several advantages thanks to cloud computing, including access to powerful computers, vast quantities of storage, constant connectivity, and a wealth of other features. Clouds

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that provide more than just a place to store data also facilitate the outsourcing of computations in the form of virtual machines (VMs). The most adaptable and all-encompassing approach of cloud computing ("Infrastructure as a Service", IaaS) allows users to host whole Virtual Machines (VMs) in the cloud. Virtual machine images serve as blueprints from which an almost infinite number of VM copies may be created. The Virtual Machines (VMs) offered by Infrastructure as a Service (IaaS) completely meet the needs of the end user in terms of available resources. Providers' resources are often housed in a data centre. Distributed data centres allow a service provider to better serve their clients wherever they may be located.

Cloud computing is advantageous since it requires no initial outlay of capital because it is based on a pay-as-you-go model of payment. Any service provider worth their salt would never need to spend money on hardware to start reaping cloud computing's benefits. Depending on its requirements, it simply leases the necessary cloud-based resources and pays for their use.

The ability to swiftly assign and reallocate resources in a cloud environment on demand helps reduce operational expenses. Because of this, a service provider is freed from the need of anticipating and planning for peak demand. This results in substantial cost savings by freeing up resources during times of low service demand to avoid spending money on unnecessary activities.

Easily scalable, since service providers pool together a great deal of data centre resources and make them available to users. It is simple for a service provider to scale up its operations to meet a sudden surge in demand (e.g., flash-crowd effect). Surge computing is a term used to describe this concept [2].

It's clear that cloud computing has enormous advantages for businesses, governments, and the general public. Cloud computing is already widely used by consumers for things like Google Mail, Amazon, and many more. To define cloud computing, we may look at its defining features.

A few of the most crucial features of clouds are as follows:
Advantages include: self-service on demand, access to a wide network, shared resources, mobility, adaptability, and measurement [3].

LITERATURE ANALYSIS

Highly dynamic and adaptable clouds, like the kind described by Amoretti et al. [3], are enabled by the framework and middleware they introduced. Such clouds are made up of peer providers and services that may be duplicated thanks to a code mobility mechanism. According to the study of Zhang et al. [4], an intelligent workload factoring utility for businesses who want to use both public cloud resources and their own internal data centres (often called "legacy"). A quick frequent data item identification algorithm is the backbone of the intelligent workload factoring system, allowing for the exclusive factoring of incoming requests. The NIST has been instrumental in establishing guidelines for the federal government's use of cloud computing. Access to a shared pool of customizable computing resources (e.g., networks, servers, storage, applications, and services) that can be promptly supplied and released with minimum administration effort or service provider involvement is made possible via the cloud computing concept [1]. This cloud model is

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characterised by its key properties, service models, and deployment methods, and it works to increase availability.

CLOUD COMPUTING ARCHITECTURE

There are two primary elements to the cloud computing architecture (hardware and application). Without perfect cooperation between these two parts, cloud computing is impossible. In order to use cloud services,One example of cloud computing is Platform as a Service (PaaS), which allows users to upload their own apps to the cloud. The term "platform as a service" (PaaS) refers to the practise of renting computing resources including servers, databases, and networks online. Customers may use the service model to rent virtualized servers and related services for the purpose of either maintaining or creating new applications.A complex interplay with the hardware that's crucial to the software's availability. If the software doesn't work, the hardware can't push data or carry out the necessary procedures. However, if the hardware fails, everything will have to halt. The applications based on Cloud Architectures only use the underlying computing infrastructure when it is required (for example, to process a user request), pull the required resources on demand (such as compute servers or storage), perform a specific job, then relinquish the unneeded resources and often dispose of themselves after the job is done. The application's size during operation may be dynamically adjusted to meet the available resources. Cloud computing's architectural layers. Take use of a provider's online software by subscribing to their "Software as a Service" (SaaS) plan. Software as a service, often known as "software on demand," refers to computer programmes that may be accessed online and/or installed locally and operated behind a firewall. SaaS refers to the licencing of software by a provider to users in the form of an on-demand service, subscription, "pay as you go," or freemium model. All the necessary hardware and software is stored in the "cloud" and is accessible through the Internet as a service, making this method of programme distribution a component of the utility computing paradigm. In the beginning, sales force automation and CRM were the primary use cases for SaaS. (CRM). Computerized billing, invoicing, human resource administration, financials, content management, collaboration, document management, and service desk management are now commonplace in most businesses.Service Platform as a Utility Platform as a Service (PaaS) developed from Software as a Service (SaaS), a software distribution paradigm in which users have access to hosted software applications through the Internet. The benefits of PaaS for programmers are many. PaaS allows for rapid updates and modifications to OS capabilities. A software development project may be worked on by a group of people in different locations. The availability of services is not limited to any one country or region. Instead of investing in and maintaining different hardware facilities that often perform redundant duties or have incompatibility issues, businesses may save money in the long run by using infrastructure services from a single provider. By combining development efforts for a single application, costs may be reduced all around. However, if the PaaS provider's solutions need the use of a proprietary service interface or programming language, the danger of "lock-in" increases. Another possible risk is that the solutions' adaptability won't be enough for certain customers whose wants are changing quickly.IaaS, or "Infrastructure as a Service," allows users to lease core components of a computer system such as memory, disc space, and network bandwidth. Storage, hardware, servers, and networking components are all outsourced by a business using the Infrastructure as a Service provisioning model. In addition to providing a physical location for the equipment, the service provider is also responsible for its operation and upkeep. Clients often pay on a per-use basis.

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Examples of IaaS features and components are:

Policy-based services; Internet connectivity; Dynamic scalability; Desktop Virtualization; Utility Computing; Automation of administrative activities;Virtual server instances from a cloud provider like Amazon Web Services may be created on demand, complete with a dedicated IP address and storage space. Customers initiate, terminate, access, and set up their virtual servers and storage using the provider's application programming interface (API). Businesses may use cloud computing to scale up or down as needed, paying only for the resources they use. This consumption-based payment scheme is frequently referred to as "utility computing" since it is similar to the way utilities like electricity, fuel, and water are billed and paid for. Sometimes the term "Hardware as a Service" is used interchangeably with "Infrastructure as a Service" (HaaS).

CLOUD DEPLOYMENT MODELS

One model for using the cloud is the private cloud, which may be either owned or rented by a company. The marketing phrase "private cloud" refers to a computational architecture that is exclusive and only accessible to a select group of users behind a firewall. With the use of virtualization and distributed computing, corporate network and datacenter managers may now successfully satisfy the demands of their "customers" inside the company. Using the term "private cloud" in advertising is meant to entice businesses who want or need greater privacy and security for their data than what they receive with a public cloud service like Amazon'.Either Simple Storage Service (S3) or Elastic Compute Cloud (EC2) (S3).

Community cloud refers to a shared server environment for a particular group of people. In order to reap the advantages of cloud computing, many firms with comparable needs may form a community cloud and pool their resources. Private clouds are more costly than public clouds since they have a smaller number of users (but more than a single tenant), but they also have the potential to provide greater privacy, security, and regulatory compliance.

To the general public, offered as a service; often very large data centres. The term "public cloud" refers to a cloud that follows the conventional cloud computing paradigm, in which a third-party vendor makes its servers, networks, software, and other resources accessible to anybody with an Internet connection. It's up to the provider whether or not they charge for their public cloud services.

• Hybrid cloud, a combination of several kinds of clouds. In a hybrid cloud, certain resources are managed and offered inside while others are managed and provided outside. A company may store historical data on a public cloud service like Amazon Simple Storage Service (Amazon S3) while keeping customer-facing data in-house. In an ideal scenario, a hybrid setup would enable a company to take advantage of the public cloud's scalability and cost-effectiveness without putting sensitive data and apps at risk. [7]

Cloud services that are available for purchase

If you want to know what Google is all about, just look at their name: Cloud Computing is where Google makes its money. Internet-delivered services such as search, e-mail, and online mapping. Voice, video, and data services in addition to office productivity tools including word processors,

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spreadsheets, presentation software, and database management systems. Users have the option of signing up for these services at no cost, or paying for more advanced features and assistance [8].

The basis of Amazon's business is ecommerce, and it is the reason it has become the biggest online retailer in the world. While online shopping is already a kind of Cloud Computing, Amazon has also been facilitating IT departments' direct access to Amazon's computational power through a number of tools it has made available. Amazon Elastic Compute Cloud (EC2) and S3 (Simple Storage Services) are two prominent instances. The items saved in S3 are accessible from any computer with an internet connection. The Elastic Compute Cloud, or EC2, is a cloud-based computing service that may be used to power everything from website hosting to simulations. All of this can be yours for a very little price per user [9].

• Microsoft: Microsoft has historically focused on operating systems and office automation applications for mobile devices. Microsoft has been offering cloud services like website hosting and electronic mail since the early days of the World Wide Web. To facilitate the synchronous/asynchronous integration of online Cloud documents with their traditional offline desktop-resident versions, Microsoft now also provides office automation capabilities via a cloud ("Office Live") in an approach known as "Software Plus Services" rather than "Software as a Service".

• Salesforce.com: Salesforce.com's primary goal has always been the distribution of features related to CRM. However, in order to achieve this central goal, Salesforce.com has become an industry leader in the SaaS model by providing a comprehensive set of features through the Internet. Force.com is a crucial feature since it allows third-party developers to build apps that run on the Salesforce.com platform yet supplement the core Salesforce.com product [10].

• VMware: Offers its own cloud computing on demand service, dubbed vCloud, and is responsible for the development of numerous key technologies that make cloud computing possible. Because of this capabilities, businesses may take use of virtualized clouds hosted either internally or by third-party service providers.

QUESTIONS REGARDING THE SECURITY OF CLOUD COMPUTING

The issue of safety is paramount. Many individuals are understandably wary about storing sensitive information on the cloud. Over the last several years, the cloud computing sector has exploded in popularity, going from a promising business idea to one of the fastest expanding parts of the IT industry. Now, businesses that have been struck hard by the recession are beginning to realise that by using cloud computing, they may save time, money, and energy.

The barriers to entry for cutting-edge commercial software and infrastructure resources are almost nonexistent. However, questions about the cloud's security are emerging as more and more personal and corporate data is stored there.

• Security

Should you save your data on a local hard drive or trust it to the high-security servers in the cloud?

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Cloud providers have a strong incentive to retain trust and, as a result, utilise a greater degree of security, although others claim that client data is safer when controlled internally. In the cloud, however, it doesn't matter where your primary data repository is physically located since your data will be spread over many different machines. Any server may be breached by diligent hackers, and insider theft accounts for almost 16% of all server intrusions. Another third of breaches occur when workers inadvertently expose sensitive information online, either by losing their laptops or storing them in public places.

• Privacy
Since cloud computing differs from the conventional model in that it makes use of virtual computing technology, users' private information may be stored in multiple virtual data centres rather than in one central location. This may occur across international borders, raising questions about compliance with data privacy laws in each jurisdiction. Accessing cloud services, however, poses a risk of consumers disclosing private data. Depending on the computing work that users submit, attackers may get insight into the most sensitive data.

• Reliability
Cloud servers have the same flaws as on-premises servers. In the cloud computing paradigm, consumers are more reliant on the cloud service provider (CSP) and hence more vulnerable to outages and slowdowns experienced by the CSP itself. There is significant variation in the service models offered by CSPs, and committing to a single CSP might result in lock-in and a corresponding reduction in corporate security.

The Law and Related Topics
Suppliers like Amazon Web Services have been able to serve large markets since 2009 despite attempts to harmonise the legislation by building up a limited road and rail network and allowing consumers to choose "availability zones." However, concerns about security and privacy persist at the individual, organisational, and governmental levels.

Free and Available References
The expansion of cloud computing relies heavily on the use of open standards. Most cloud services provide available APIs; they are usually well-documented but are implementation-specific and hence incompatible. Several open standards are now being developed, notably the Open Cloud Computing Interface from the Open Grid Forum, and some businesses have already implemented APIs from other organisations. A group called the Open Cloud Consortium (OCC) is trying to get everyone on the same page when it comes to basic cloud computing protocols.

• Compliance
Providers of cloud services must ensure that their clients can comply with the many laws and policies governing the storage and use of data by making available the necessary tools, such as audit logs and periodic reports. The book Managing Compliance and Security for Cloud Computing explains how a bird's-eye perspective of all IT resources in a cloud-based location may result in more effective administration and enforcement of compliance regulations. Cloud providers' data centres may have to meet regulations in addition to those that apply to their clients. Browser and

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web service security features and capabilities. Because it may be accessed over an unprotected internet connection, the cloud is a major target for criminal persons and may have drawbacks. Information retrieval is also covered, along with the deployment methods that aid in doing so. There are three distinct approaches to cloud computing: SAAS, PAAS, and IAAS. When you can access your data from any device with an internet connection, you can do so much more with computers. There are, however, costs associated with this easiness. Your privacy is compromised, and you have little visibility into the physical location of your data's storage. The security hazards associated with cloud storage must also be considered.

As cloud computing technology is still in its infancy, several future technical prospects exist for cloud analytics and a wide range of cloud services.

Freedom
Cloud computing does not allow users to physically possess the storage of the data, leaving the data storage and control in the hands of cloud providers. Customers will contend that this is pretty fundamental and affords them the ability to retain their own copies of data in a form that retains their freedom of choice and protects them against certain issues out of their control whilst realizing the tremendous benefits cloud computing can bring .

Long-term Viability
You should be sure that the data you put into the cloud will never become invalid even your cloud computing provider go broke or get acquired and swallowed up by a larger company. "Ask potential providers how you would get your data back and if it would be in a format that you could import into a replacement application.

CONCLUSION

In this paper we discuss about the emerging technology and its architecture including various Layers. Cloud computing is a new term that is introduced in business environment where users can interact directly with the virtualized resources and safe the cost for the consumers. In this paper the benefits and security issues are addressed as well. There are some security measures and some are under research that Provide Security on each layer that we discuss in this paper. Security in cloud computing consist of

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