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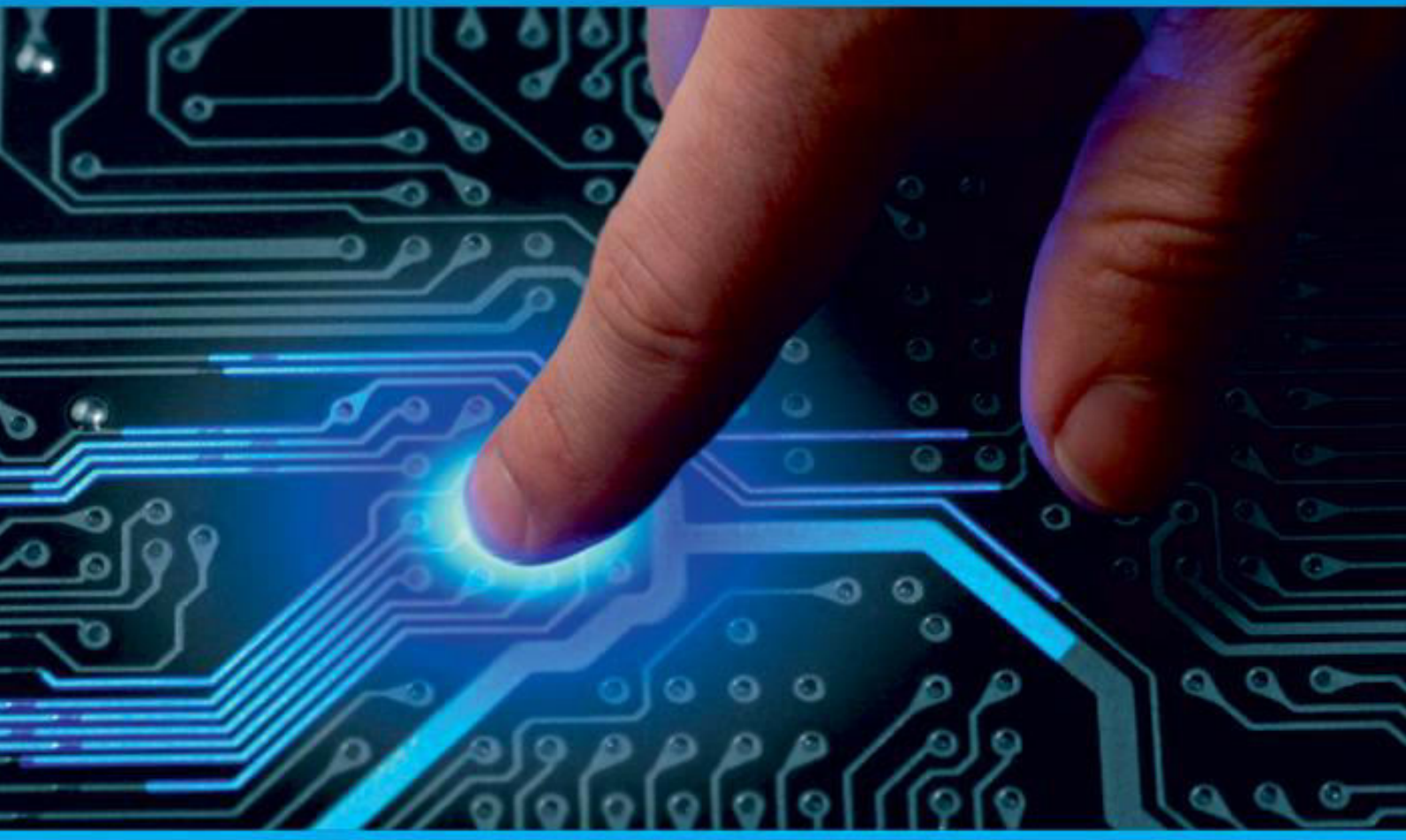

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A Secured Framework in Cloud Computing Environment

[1]Suraj Shaw, [2]Taniya Roy, [3]Anirban Bhar, [4]Sujata Kundu

[1,2] B. Tech student, Department of Information Technology, Narula Institute of Technology, Kolkata, India.

[3,4]Assistant Professor, Department of Information Technology, Narula Institute of Technology, Kolkata, India.

ABSTRACT: A computer architecture known as cloud computing uses the Internet to deliver IT resources like applications, infrastructure, and platforms as a service. In order to handle the vast amounts of data, cloud computing provides infrastructure for computing and processing of all forms of data resources. This Internet-based modern technology has increased processing power, flexibility, and capacity. With its influence and advantages, this technology has recognized the value of the service-oriented concept and created a new system in the computing industry. The possibilities of cloud computing have allowed for one step forward in the IT industry. Presently, enormous and well-known businesses have switched to cloud computing and moved their processing and storage there.

Cloud computing is the provision of resources such as network, storage, and servers on demand or as a pay-per-use model over the internet. Although cloud computing is helping the information technology sector, there is still room for improvement in terms of research and development. An advanced survey that focuses on the cloud computing idea and the most cutting-edge research concerns is what we have to offer in this study. This article clarifies cloud computing and discusses crucial research questions in this developing field of computer science.

KEYWORDS: Cloud computing, Security issue virtualization, Server consolidation,Cloud security.

I. INTRODUCTION

On-demand network access to computing resources is known as cloud computing. These resources are frequently offered by an outside party and only require little supervision. Servers, storage space, networks, applications, and services are some of these resources [1][2]. There are numerous cloud computing architectures and practical models available, and these can be combined with other technologies and design strategies [3].

Cloud computing is ranked as one of the top ten disruptive technologies for the foreseeable future by Gartner [4]. It represents the long-held ambition of realising computing as a service [5], where the principles of the economy of scale assist in significantly lowering the cost of computing infrastructure. To provide redundancy and ensure consistency in the event of site failure or collapse, major firms including Sun Microsystems, Google, IBM, Amazon, and Microsoft have started to create additional data centres for hosting Cloud computing applications in various places across the world.

For those looking for speedy implementation methods today, the cloud is the best option [6]. Cloud computing refers to the provision of applications, such as hardware and software, in virtual data centres via the internet and is a type of programmable, parallel, distributed, virtual, and flexible system [7]. Customers pay costs based on the utilisation of resources and services and can customise cloud computing services [8][9][10][11].

The phrase "cloud" in cloud computing refers to a collection of networks, much like actual clouds, which are collections of water molecules. The user has limitless access to cloud computing capabilities whenever needed. Users typically prefer a middleman provider for the internet service in cloud computing rather than setting up their own physical infrastructure. Only the services that the users really used must be paid for [12]. To lessen the workload in cloud computing, the workload can be moved. Because the networks that make up the cloud carry a lot of the service load, running an application on local computers does not put a lot of strain on them [13]. As a result, there is a reduction in the user's need for hardware and software.

II. HISTORICAL BACKGROUND

Cloud computing has evolved in a variety of ways since the 1960s, with Web 2.0 being the most recent development. However, since the Internet didn't start to offer much bandwidth until the 1990s, cloud computing for the general public has been a bit of a latecomer. The launch of Salesforce.com in 1999, which invented the idea of offering enterprise software via a basic website, was one of the first significant turning points in the history of cloud computing.

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The services company opened the door for both niche and big software companies to offer applications online. Amazon Web Services (AWS), which offered a variety of cloud-based services including storage, processing, and even human intelligence through the Amazon Mechanical Turk, was the following innovation in 2002.Then, in 2006, Amazon introduced its Elastic Compute cloud (EC2) as a for-profit web service that enables little-known businesses and private individuals to rent computers on which to run their own software. When it comes to cloud computing infrastructure, "Amazon EC2/S3 was the first extensively used service", according to the company, which offers its SaaS online video platform to UK TV stations and newspapers.

Another significant turning point occurred in 2009 as Web 2.0 gained momentum and Google and other companies began to provide browser-based enterprise applications through services like Google Apps.The development of "killer apps" by industry titans like Microsoft and Google has made the biggest contribution to cloud computing. A larger widespread acceptance of online services results when these businesses provide their services in a style that is dependable and simple to use for consumers. The development of universal high-speed bandwidth, universal software interoperability standards, and the maturation of virtualization technologies are additional important aspects that have facilitated the evolution of cloud computing.

The grid, parallel and distributed systems, virtualization, multi-core chips, and Internet technologies are all precursors to the cloud computing phenomenon (Buyya et al., 2009). On-demand self-service, wide network access, resource pooling, quick elasticity, and measured service are characteristics that set cloud computing apart from related technologies (Buyya, Broberg, &Goscinski, 2011). Although there is still no agreed-upon definition of cloud computing, researchers and business leaders are making substantial progress in this direction. Attempts to define cloud computing have been made by Buyya et al. (2009). They describe it as "a parallel and distributed computing system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation betweentheserviceproviderandconsumers".

III. COULD COMPUTING FRAMEWORK

In the field of IT, cloud computing has achieved a significant breakthrough. Its appearance has genuinely altered the IT industry. It has been crucial in meeting the growing demand for infrastructure and storage. The capacity of cloud to deliver resources like hardware and software through a network is a remarkable capability. Numerous cloud computing resources are available and can be hired on a pay-per-use basis. We can broadly categorise the cloud as [14]:

1. Private cloud: This kind of cloud is used by a single, clearly identified company or organisation, such as a cloud for a single enterprise.

2. Public cloud: Google, Amazon, Microsoft, and other companies offer public clouds with ease. Any enterprise or the general public can access infrastructure and services via public clouds.

Hundreds or thousands of people share the same resources.

3. Community cloud: In a community cloud, infrastructure and services are made available to groups with comparable goals.

4. Hybrid clouds: These clouds combine elements of both private and public clouds. Even though the clouds are mingled together, each one still has a distinct identity, helping numerous deployments.

Some common Cloud Service Providers are:

Google: This is a pure cloud computing service that uses online storage for all of its data so that Google Docs, Google Sheets, and Google Slides may be used. In fact, the majority of Google's services—including Gmail, Google Calendar, Google Maps, Picasa, Google Analytics, and others—could be categorised as cloud computing.

Apple iCloud: This is largely used for online backup, synchronisation, and storage of your mail, contacts, calendar, and other data. The information we require is still accessible on an iOS, Mac OS, or Windows device.

3. Amazon Cloud Drive: Music, ideally MP3 that you buy from Amazon, and photographs are stored at the major retailer primarily.

A microprocessor or a cell phone are examples of discrete pieces of technology; cloud computing is not. As a system, it focuses mostly on resources. Utilizing services controlled by outside corporations is made possible for businesses by cloud technology. Systems for cloud computing are especially well-established for commercial or academic uses. Businesses may operate more productively and spend less on the gear and software necessary to perform various activities thanks to cloud computing [15].

Businesses can use cloud computing to expand their IT capabilities without having to hire more staff, buy more software, spend more on training, or build new equipment.

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The following list includes the fundamental cloud computing models:

A. Infrastructure-as-a-Service (IaaS)

In Infrastructure as a Service (IaaS), the cloud service provider offers a collection of virtualized computer resources including CPU, Memory, OS, and Application Software etc. Virtualization technology [6] is used by IaaS to transform physical resources into logical resources that customers can dynamically provision and release as needed. Rackspace Cloud Servers, Google, Amazon EC2, IBM, and Verizon are some of the well-known businesses that provide infrastructure as a service.

B. Platform as a Service (PaaS)

This form of cloud computing service is more sophisticated. In PaaS, a cloud service provider provides, manages, and runs additional computing resources as well as system software (i.e., the operating system). PaaS services cover application design, development, and hosting. Collaboration, DB integration, security, web service integration, scaling, and more services are also provided. Users are not required to manage their own hardware and software resources or to employ professionals to do so. This approach allows freedom in installing applications on system; scalability is another feature of the PaaS. A drawback of the PaaS is the lack of interoperability and portability among providers.

C. Software as a Service (SaaS)

In this arrangement, operating systems, application software, and other resources are managed and updated by cloud service providers. SaaS model appears to the customer as a web-based application interface where internet is used to deliver services that are accessed using a web-browser. Mobile phones, PCs, and other devices can all be used to access hosted services like Gmail and Google Docs. SaaS provides the benefit of not requiring the consumer to purchase licences, install, upgrade, maintain, or use software on his own computer [16]. Additionally, it has other benefits including multitenant effectiveness, configurability, and scalability [17].

D. Recover as a Service (RaaS)

Companies can replace existing backup, archiving, disaster recovery, and business continuity solutions with a single, integrated platform by using recovery as a service (RaaS) solution. Companies can restore complete data centres, servers (OS, apps, configuration, and data), and database files with the aid of RaaS suppliers.

RaaS assists commercial buildings in lessening the effects of downtime in the event of disasters or similar circumstances. DRaaS is another name for RaaS. (Disaster Recovery as a Service) Examples of businesses using RaaS include WindStream Business, Geminare, and others.

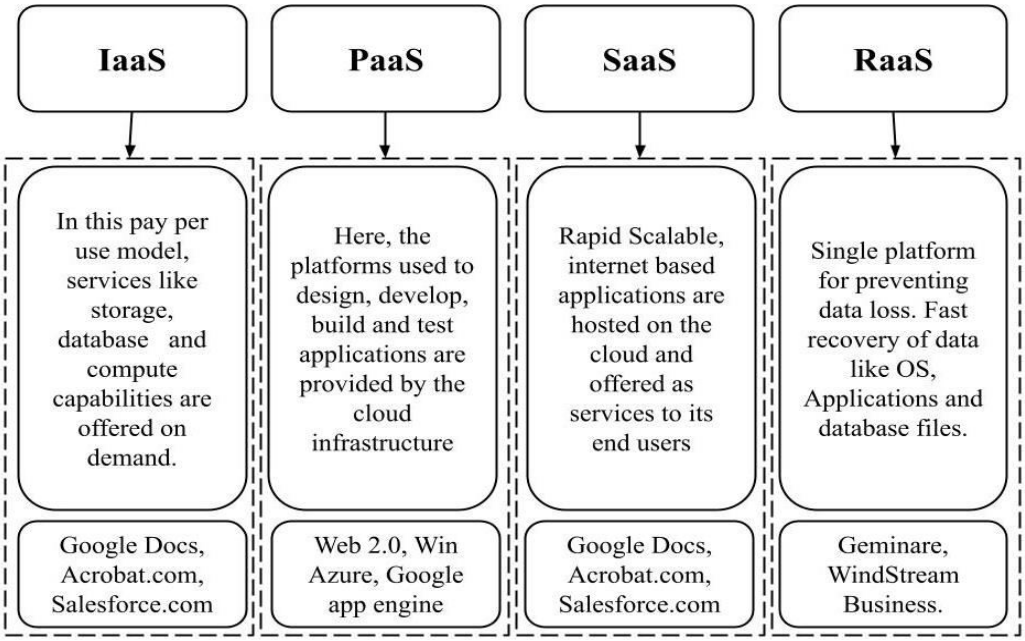

Fig.1. Cloud Models

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The fundamental traits can be elaborated as follows:

• On-demand self-service: Through a web-based self-service portal, users can provision cloud computing resources without interacting with a human (management console).

• Wide-ranging network access: Cloud computing resources are reachable across a network, enabling a variety of client platforms like workstations and mobile devices.

• Resource pooling: By safely dividing the resources on a logical level, several customers can be served using the same physical resources.

• Rapid elasticity: Based on triggers or parameters, resources are provisioned and released automatically, on-demand, or both. By doing this, you can be confident that your application will always have the capacity it requires.

• Metered service: Resource usage is tracked, metered, and openly reported (billed) based on utilisation. Simply put, pay to use.

For a client to run their application and data on, an infrastructure as a service solution should include vendor-managed network, storage, servers, and virtualization layers. The next step is to add vendor-managed middleware, such as web, application, and database software, to the infrastructure as a service foundation created by platform as a service. On top of that, software as a service adds apps that execute certain user functionality, such as email, CRM, or HRM.

The fourth service model, known as business process as a service, has been interestingly added by IBM and other significant IT and analyst organisations (BPaaS). As the name suggests, BPaaS provides a full horizontal or vertical business process and builds upon any of the cloud service models previously mentioned.

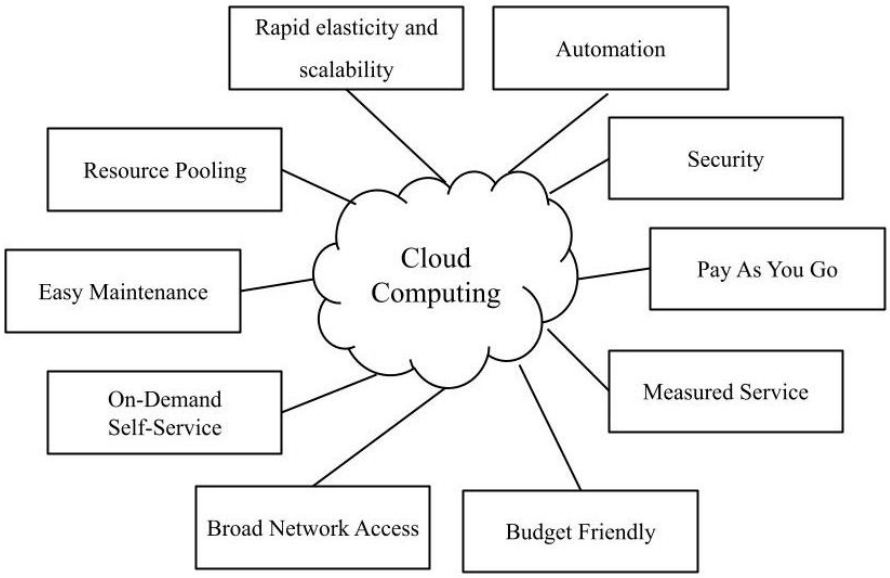

Fig.2.Essential Characteristics of Cloud Computing

Adopting the cloud for large-scale cloud deployment services is fraught with difficulties. Security comes first and foremost. The concern for data security in the cloud is currently elevated due to the new paradigm, but it is similar to that of protecting the network, storage, and datacenter services in hosted and utility-based systems in some ways. The security in this architecture is felt at higher levels since the services are opened and delivered through the network between the cloud service provider and the consumer. Others include location-independent resource sharing, which keeps consumers in the dark about the locations of their services and data storage. Additionally, it is thought that compared to dedicated versions, multi-tenant solutions are a little less secure.

With cloud computing, the focus shifts to the interface, namely the interface between various groups of service users and service providers. When it comes to distributed services, procurement, risk assessment, and service negotiation, cloud services will require knowledge that many businesses lack.

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IV. CLOUD COMPUTING AT PRESENT

Cloud computing is essentially implemented and used on the internet. Users of all types, including people and businesses, can access and store resources and data on many platforms without owning the physical storage and server infrastructure. Google Drive, One Drive, etc., as examples. Additionally, the 2020 Cloud Computing Survey (as quoted in Knorr, E., 2020) found that 92% of the firm has partially moved to the cloud in terms of business activities. The third-place spending category for businesses is budget allocation and expenditures for cloud computing. More specifically, the typical cloud investment is 73.8 million USD. Gartner (2019) predicted that cloud computing will expand by 17 percent in 2020, reaching a market value of 266.4 billion USD from 227.8 billion USD in 2019. The cloud service sector has been growing globally, according to Accenture (2021), and in 2020 it was valued at 370 billion USD. 83 percent of enterprise workloads will change and move to cloud technologies by 2020. (Columbus, L., 2018). The enterprise workload, which consists of multiple information support systems to gather, disseminate, analyse, and prioritise customers, is the organization's brain (IST). The technologies utilised in the company' operations are integrated and accessible via the web with cloud-enabled workload solutions. Therefore, a cloud solution can be scaled up or down depending on how much business demand is increasing or decreasing. Notably, Sid Nag of Gartner claimed that widespread use of cloud computing has already occurred (Gartner, 2019).

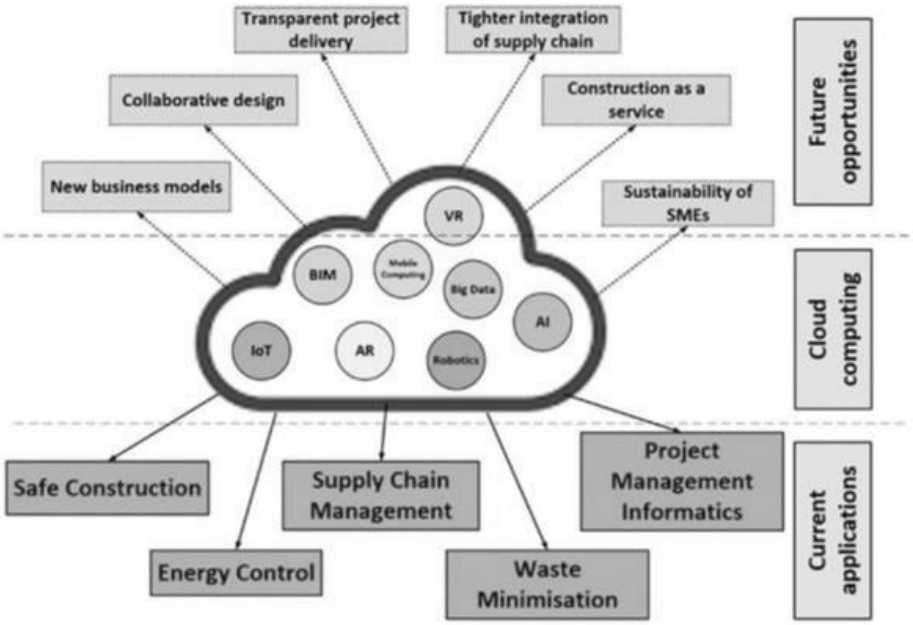

Fig.3.Cloud Computing Applications

Cloud-based Solutions:

Information systems are a resource for the company that can handle anything from management and decision-making to transaction processing. A storage device must be maintained since IS stores, processes, and retrieves data. The processing power of IS is impacted by a massive amount of data. The supply of services to clients is significantly impacted by delayed processing times, which later hurts the company's financial results. The cloud computing IaaS companies, which sell virtual storage and server space that is remotely hosted by vendors, include Microsoft Azure and AWS. Additionally, businesses have the option of purchasing information system software licences or subscriptions (also known as SaaS), which have already been created and put through testing by other clients. An illustration of a SaaS provider is SAP, which offers enterprise resource planning (ERP) as well as analytical tools for business operation and decision support. Algrari (2017) asserts that the primary benefit of cloud computing for enterprises is the ability for dynamic and ideal IS resource usage. Additionally, its economic quality draws IT investment. One of the factors influencing the increased popularity of cloud computing is the move toward cloud-based solutions (Fortune Business Insights, 2021). Russell et al. (2010) claim that the corporation picked the SaaS model of cloud-based DSS due to its pervasive network (including Wi-Fi, cellular technology, IoT, etc.), affordable storage costs, and high-level computer capability. In addition, consumers are relieved of the responsibility of managing costly infrastructures and

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software maintenance and updates. As a result, attention may be focused on applying the solution to enhance the organisation.

Big Data and AI: A Driver

According to the Fortune Business Insights market research report from 2021, the growth and importance of Big Data and Artificial Intelligence (AI) is a key element in both the acceptance and expansion of cloud computing. What are AI and big data? Big Data is a by-product of the constant increase in data production and storage. both structured and unstructured data is included. Segal (2021) claims that big data is utilised by businesses to do analyses since it has the ability to hold essential information about the company, the consumer, attitudes, etc. On the other hand, deep learning and machine learning can all be grouped under the umbrella term of artificial intelligence. The commonly accepted definition of AI is a computer system that strives to act, think, and make decisions similarly to humans. Implementing and managing storage and servers to handle their Big Data will be extremely difficult for businesses. Data will be generated continuously, which will necessitate ongoing infrastructure upkeep and enhancement. Big Data is also processed, in addition to being saved. To do Big Data Analytics with AI, a lot of server computing power is therefore needed. With cloud computing, clients may quickly buy cloud services from a variety of reputable and top-notch cloud service providers without taxing the resources on maintenance and upgrading. Notably, Sharma (n.d.) asserts that Big Data and Cloud Computing are an ideal marriage with limitless potential. The cutting-edge cloud computing infrastructure can be exploited to find value in Big Data rather than leaving it dormant, but only when the technology is used efficiently.

A Case Study: Broadcom Inc.

A multinational business, Broadcom Inc., provides infrastructure implementation services for technology, including broadband, mainframe, and data centre solutions. But then the unexpected COVID-19 outbreak struck out of nowhere. Therefore, Broadcom collaborated with Deloitte Cloud Services to develop a cloud solution that will help maintain and protect its employee's health. The physical labour required by Broadcom to build and develop the infrastructures puts the workers at risk for contracting the COVID-19 virus. For Broadcom, Deloitte was able to create connect @BRCM, a real end-to-end integrated system. The system produced excellent outcomes, including:

1. Quick notification and prompt reporting of employee COVID-19 incidents.
2. contact tracing efforts are going digital.
3. Accessible solution design that enables use of a lanyard-worn device and mobile devices.
4. interfaced with AWS, which will act as a core solution for worker engagement and health outside of the COVID-19 epidemic.
5. Because of its straightforward design, the solution required little to no user training, which greatly accelerated staff adoption.

American Airlines serves as a case study for the use of cloud migration to provide customers with digital self-service capabilities for a novel experience. American Airlines is a U.S.-based airline provider that provides both local and international service to and from the country. In order to establish and create a competitive differentiation through customer experience, the airline firm teamed with IBM. rapid access to information and services, specifically. In addition to losing its competitive edge, American Airlines had inefficiencies when using old platform approaches, operations, architecture, and development. As a result, they sought to adapt and react by utilising recent technical advancements. Migration to IBM's Cloud Infrastructure and virtual machines is the company's proposed option. transforming the methods and abilities used in application development at American Airlines. Utilize outstanding, round-the-clock cloud solutions support.

V. CONCLUSION AND FUTURE WORK

Cloud computing is currently on the minds of IT organizations all around the world. Companies who employ cloud computing for the implementation and scaling of IT for business processes stand to gain significantly from it. Cloud computing services are being adopted by an increasing number of businesses, from accounting corporations to zoological organizations. On desktop and mobile devices, millions of users use online cloud services like Apple iCloud, Gmail, and Dropbox every day. The $80 billion worldwide cloud computing business is still experiencing increased rivalry between cloud and outsourced providers. Developers should consider the rise of cloud computing since we anticipate it.We think that compute, storage, and networking should all put more of an emphasis on the horizontal

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scalability of virtualized resources than on the single node performance, regardless of how a cloud provider provides services.

In the coming years, the field of IT is anticipated to undergo a rapid transformation thanks to an emerging technology called cloud computing.Due to the Cloud's many fascinating and promising properties, services, and applications, a wide range of applications and services can be offered there. We examined a few of these features, services, and applications in this paper, and we are confident that many more will be examined in the near future. Our study helps them understand the effects of these services on their businesses, but cloud computing technology is not without hazards and worries. As a result, it is anticipated that many enterprises and individuals from various disciplines would be drawn to cloud services and applications. Issues with security and privacy continue to be the main obstacle to cloud computing.

Future development in cloud computing will undoubtedly centre on creating different strategies that can handle its security challenges. In our upcoming work, we'd like to tackle the issue of cloud computing security and try to suggest a framework and security model that would address security threats and reduce risks.

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