International Journal of Scientific Research in Computer Science, Engineering and Information Technology

ISSN : 2456-3307 OPEN ACCESS

Available Online at : www.ijsrcseit.com

Volume 10, Issue 7, May-June-2024 | Published Online : 20th June 2024

Exploration of Cloud Computing and It's Scope of Improvement In Future

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ABSTRACT

The advancement of technology in the recent years has led to the development of modern computing paradigms, and cloud computing is one of them. Cloud computing, which is simply the availability of services on the internet without direct management, is widely in use today. We can see a drastic shift from conventional methods of data storage and management to cloud computing in the last few years in every small and large-scale enterprise. The benefits offered by cloud computing, particularly the pay-as-you-go model that can lower capital costs, can explain its rise in popularity. This review paper provides a concise and comprehensible outline of cloud computing and its developments. Firstly, we demonstrate the characteristics and architecture of cloud computing. The relevant research in this area, its applications, and room for further development are then discussed. Finally, we offer a conclusion on all the aspects discussed earlier.

KEYWORDS : Cloud computing, Technology, Services, Infrastructure, Application, Cybersecurity.

I. INTRODUCTION

Cloud computing is defined by United States National Institute of Standards and Technology (NIST) as "A model that allows for the widespread, easy, and instantaneous provisioning and releasing of a shared poolof reconfigurable computing resources (such as networks, servers, storage, apps, and services) with the least amount of administrative labour or service provider involvement". This definition also identified five essential characteristics:

- On-request self-administration: A purchaser can ask for and access processing administrations, for example server duration, as well asorganization stockpiling, adjusting to the circumstances without needing to communicate withpeople.
- Widespread network access: Services can be accessed via standard mechanisms that are utilized by a variety of clientplatforms (such as mobile phones, tablets, laptops, and workstations) over the network.
- Resource pooling: Different physical and virtual resources are dynamically assigned and reassigned in line with customer demand. The provider's computing resources are pooled to serve several clients through the use of a multi-tenant method.
- Quick elasticity: In order to scale quickly both inside and outward in accordance with demand, capabilities can be elastically provisioned and released, sometimes instinctively. The user frequently feels that the

capabilities that are made available for provisioning are endless and can beemployed in any quantity at anymoment.

- Service measurement: By utilizing metering at a level of abstraction appropriate for the type of service (e.g., processing, storing,bandwidth, active user accounts), cloud systems instinctively regulate and maximize resource utilization and resource utilization can be examined, regulated and released, providing accessibility to the service provider and the user of theservice. [1]

II. ARCHITECTURE

Fig 1 shows the reference architecture of cloud computing. It gives a high-level summary of the Cloud and lists the key player along with their functions. Every player in the context of cloud computing is an entity, meaning that it might be a person or an organization that engages in a transaction or process or carries out specific activities. The cloud provider, cloud consumer, cloud broker, cloud carrier, and cloud auditor are the five primary players.

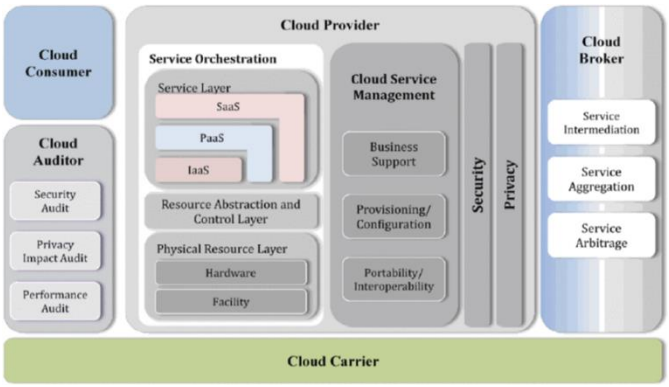

FIGURE 1. The reference architecture of Cloud computing by NIST.

An organization that offers a service to interested parties is called the cloud provider. An organization that utilizes services from one or more cloud providers and maintains business ties with them is called a cloud consumer. The Cloud Broker is an organization that oversees the use, performance, and the provision of cloud services and settles disputes between Cloud suppliers and Cloud customers. The Cloud Carrier is a middleman that connects cloud suppliers and cloud users, facilitating the provision of cloud services. The Cloud Auditor is an impartial third party that evaluates the Cloud infrastructure, including services, performance, security, and information systems operations.[2]

III. RELATED WORK

The beginnings of cloud computing may be traced back to the 1960s, when time sharing became more common owing to disconnected work input. This was a period of research and evaluation of methods to increase end-user efficiency, optimize the platform, infrastructure, and applications, and make more people have access to large scale computing power through time- sharing [3]. First introduced by General Magic in 1994 to characterize the realm of locations in which agents on the go may visit the can Telegram script environment, the term "cloud" refers to an analogy with regards to computerization services. The term "cloud computing" acquired significant popularity in 1996 when Compaq Computer Corporation produced a business plan regarding the web and future computing.

The cloud era in the 2000s began with the introduction of AWS in 2002, which allowed developers to design independent applications. Google Docs' beta version was launched in 2006, along with the Elastic Compute Cloud (EC2) on Amazon, Amazon Simple Storage Service (Amazon S3), and NASA's creation of the initial freeware for both private and blended cloud deployment in 2008 [4]. Other cloud services started to appear during the ensuing time. 2010 saw the launch of Microsoft Azure, a freely available server project, by NASA, Rackspace Hosting, and Microsoft. 2011 saw the release of the framework for IBM Intelligent Cloud, and 2012 saw the introduction of Oracle Cloud by Oracle. December 2019 saw the launch of AWS Outposts by Amazon. Through this service, customers can access AWS infrastructure, services, APIs, and tools for their data centres, co-location spaces, or on-premises facilities. Since the global pandemic of 2020, the cloud has grown in popularity because of the level

of data protection it provides and the range of working options it offers to all employees, particularly remote workers.

IV. APPLICATIONS

The cloud found applications in many fields like data storage, management, business, education and art. It has been viewed as a business model more than an innovative technology. They provide appealing options for managing and acquiring software platforms and computer resources in addition to the ability to quickly add new features as a reaction to changing user demands.

Cloud technologies give businesses the capacity for performing their core operations in a new environment, which offers a solid foundation for launching or growing an organization without having to make major investments in capital. By guaranteeing access to practically infinite assets when required, technologies promote the business' quick expansion. Businesses can design a flexible development plan based on cloud technology that optimizes resource utilization, requires very little maintenance work, and effectively implements business activities. [5]

Nowadays, the greatest choice available for people searching for methods of rapid deployment is cloud. Cloud is a phrase employed to describe a type of parallel, adjustable, dispersed, virtual, and adaptable platform that involves the online provisioning of hardware and software applications in simulated data centres. Customers can customize cloud computing services and pay for resources and services they utilize.[6]

V. ADVANTAGES OF USING CLOUD COMPUTING

• Cost Reduction - When software is employed for a service, it allows commercial enterprises to spend less on IT resources, enhancing both the efficiency and the success of their business ventures. Consumers must pay based on how much they use.

• Increased productivity - Businesses and individuals can set up meetings, send and receive emails and messages using cloud-based apps from different vendors.

• Scalability - A distinct feature of cloud is scalability which is very beneficial. A company can use fewer virtual servers than it currently uses, based on service demand. It takes up less space and aids in rearranging it to follow their desired development pattern.[7]

VI. SCOPE OF FUTURE IMPROVEMENT

In the IT sector, cloud computing continues to be a dominant paradigm due to its advantages like providing on demand services via the web. It encourages cost- efficiency and agility by supporting a broad range of applications such as AI, IoT, data processing and storage. Some trends include using several clouds for resilience, using serverless computing for operational simplicity and placing more focus on security and regulatory compliance. All things considered; cloud computing is still crucial for many multinational corporations to advance their digital transformation.

In terms of it's potential for advancement, international companies are starting to create proprietary cloud networks tailored to their own requirements. Instead of utilizing common service providers' cloud networks, many major companies are aware that it is more profitable to provide their own. As cloud service providers increasingly develop more complex offerings, they will be able to customize the cloud to answer the needs of each corporation, thereby allowing companies to outsource their IT departments [8]. Many companies analyse data several times a year. Complex computers are needed by businesses for analytics. However, this analysis will soon be part of cloud computing, enabling companies to access analytical data whenever needed. Consequently, companies won't need to buy expensive machines of their own to satisfy those high standards.

Further, cloud computing spreads to other domains. Mobile cloud computing is defined as the integration of cloud computing with mobile devices to provide mobile devices with computational power, memory, and storage [9]. This can help improve battery life and hardware of a smartphone. In the modern era, mobile cloud computing is crucial for digital social media platforms such as gaming, photo and video editing, and general e-business.[10]

Future innovations in cybersecurity, artificial intelligence, and quantum computing are expected to propel significant advancements in cloud computing. These advancements will revolutionize security, scalability, and accessibility, facilitating more efficient and flexible business processes. The integration of edge computing and hybrid cloud models is anticipated to enhance performance and reliability, meeting a broad spectrum of user needs across several industries. As technology advances, stakeholder collaboration will be crucial for managing complexity, realising cloud computing's full potential, and ensuring that it remains a cornerstone of digital transformation for years to come.

VII. CONCLUSION

Cloud has employed many applications in recent times due its significant features like on-request self-administration, widespread network access, resource pooling, quick elasticity and service measurement. The Cloud providers, Cloud consumers, Cloud brokers, carriers and auditors form the architecture of cloud which has employed applications in data storage, management, business and education sector as well. Cybersecurity, Artificial Intelligence and quantum computing will lead to advancements in the future. The integration of edge and fog along with cloud computing represents a comprehensive approach for effectively handling and managing data and computational resources, augmenting the adaptability of diverse applications. Advancements in these fields will transform security, scalability, and accessibility, facilitating more effective and adaptable business processes.

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