Cloud Computing: A Survey

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Abstract: Cloud computing is not a brand-new technology, but it is one of the newest technologies available today because of how much it has changed how data and services are managed. In order to function properly, cloud technology must be scalable, adaptable, extensible, and manageable in order to satisfy the objectives of enterprises. The major change in the computing environment that cloud computing has brought about is the relocation of the data center off-site to a third party and the decision to purchase services rather than directly manage on-site applications. By using it, businesses can save operational costs and concentrate on their core competencies rather than worrying about various IT challenges. Furthermore, the cloud offers genuine portability by making it possible to access programmers and files from any location in the globe using only inexpensive technology and the internet. This paper provides a concise overview of cloud computing by outlining its development, history, definition, and deployment models.

Keywords— Cloud Computing, Data Lock-in, Green IT, Grid Computing, Utility Computing, Virtualization.

I. Introduction:-

Every institution in the modern world needs to start identifying the specific areas of their operations where Cloud Computing (CC) is required in order to obtain a competitive edge and stay relevant in their industry. Pay per use is a unique feature of cloud computing, requiring users to only pay for the services they really utilize.

The IT industry has undergone a significant transformation with the move to the cloud. Regardless of the size or industry, it is transforming the way we all work and manage our systems. One of NIST's official definitions of cloud computing is [1]

"Cloud computing is a model for enabling ubiquitous, 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. This cloud model is composed of five essential characteristics, three service models and four deployment models."

Therefore, cloud computing allows smaller businesses to compete with much larger ones while also saving a tonne of money and utilising energy effectively. Only their bandwidth connection needs to be a concern for users; everything else will be handled by the cloud provider, for which customers will pay a little fee based on consumption.

The paper then continues as follows: The second section gives a quick overview of cloud computing's history. An overview of the cloud's elements, characteristics, and functions is given in the third part. Service models and cloud computing deployment models are covered in section 4.

II.   History of Cloud Computing:

Cloud computing is not a brand-new idea. John Mc Carthy first put forth the concept in the 1960s when he proposed the idea of "Utility Computing. "Similar to utility computing, cloud computing considers computing as a service rather than a particular technology or commodity. As a metered service similar to other common household services like water, electricity, gas, and telephone, the former is defined as a package of computing resources including computation, storage, and devices. Because computational resources are basically rented on a demand basis, the approach benefits from having low beginning costs by preventing under- and/or overutilization of resources.[2]

Grid computing leads to the slow evolution of cloud computing. The more user-friendly iteration of grid computing is known as cloud computing. A Grid is a sort of parallel and distributed system that permits the sharing, selection, and aggregation of geographically distributed "autonomous" resources dynamically at runtime depending on their availability, capability, performance, cost, and users' quality-of-service requirements. [3]

Böhm, M., S. Leimeister described it as an IT deployment as well. A virtualization-based approach in which the service provider in charge of providing that service distributes the related resources, such as infrastructure, applications, and data, over the internet as a type of distributed service. The pricing is flexible enough to be based on a pay-per-use model, allowing the service to be scaled according to individual needs. [4].

In order to achieve agility, flexibility, and energy-efficient resource usage, logical resources are abstracted from the underlying physical resources through the process of virtualization. [5]

There are various forms of virtualizations in the cloud, including server, storage, and network virtualization. The mapping of a single physical resource to numerous logical representations or partitions is known as server virtualization. The goal of storage virtualization is to make storage devices as efficient as possible. A network can be logically divided into many pieces or multiple networks can be integrated into a single network through virtualization. So a dynamic cloud infrastructure is ideally suited for virtualization. [6]

Different definitions from different researcher showing the strength of CC a different perspective but all centred around one thing: in their respective definition, they all say it is

one form of the model. This makes it very distinct and more emphasis is laid on the model itself. Before the models are considered, there is a need to examine the characteristics of cloud computing critically, as it deals and relates to the models.

III.   Essential Characteristics:-

The NIST definition describes five essential characteristics of cloud computing [7].

- **Quick Elasticity:** Its definition is the capacity to adjust resources both upwards and downwards as necessary
- **Measured Service**: The cloud provider manages and keeps an eye on cloud services. This is essential for a variety of functions, including billing, access control, resource optimization, and capacity planning**.**
- **On-Demand Self-Service**: It implies that a user can utilise cloud services as required without interacting with a cloud provider directly**.**
- **Ubiquitous Network Access:** It implies that the capabilities of the cloud provider are accessible over the network and can be accessed by thick and thin clients using conventional methods.
- **Resource Pooling:** Using a multi-tenant model, it enables a cloud provider to provide services to its clients. According to consumer demand, physical and virtual resources are assigned and redistributed. However, the customer may be able to specify location at a higher level of abstraction (for example, country, state, or datacentre). The customer typically has no control or knowledge over the precise location of the provided resources**.**

IV.   The Service Models of Cloud Computing:-

The service models of CC are made based on modern-day data centres which integrate the three (3) service models which are the Software as a Service (SaaS), Platform as a Services (PaaS) and Infrastructure as a Service (IaaS) and provide them as utilities by letting consumers to pay just for what they use (pay per use.) Data centres provide the hardware in which the clouds run on and they form the foundation of the cloud. Data centres are generally built of numerous servers linked with each other; and are sited in thickly crowded bands, where there is minimal risk of a natural disaster

- **A. Software as a Service (SAAS)** – In this arrangement, a consumer that uses an application online has it hosted as a service. Therefore, the buyer is spared the stress of software maintenance and updating Customer relationship management (provided by Salesforce.com), video conferencing, mail services, data sharing, Google Docs, accounting, online analytics, and web content management are a few of these applications.
- **B. Platform as a Service (PAAS)** –It provides every resource needed to create applications. Software installation and download are not required. It also goes by the name cloud ware. Application design, development, testing, deployment, and hosting

are services offered by PAAS. Two examples in this group are Microsoft Azure and Google AppEngine. The ability for development teams that are geographically separated to collaborate, the ability to combine web services from various sources, cost savings from using built-in infrastructure services for security, scalability, and failover rather than having to buy and test them separately, and cost savings from using higher-level programming abstractions are just a few advantages of PAAS.

C. **Infrastructure as a Service (IAAS) –**It offers the hardware that the SAAS and PAAS applications' applications can run on. So it also goes by the name "Hardware as a Service" (HAAS). IAAS offers storage space, network hardware, and computing power as its physical resources. Depending on the potential resource requirements, the infrastructure can be scaled up or down. Additionally, multiple tenants may use the equipment at once. Resources are typically billed on a utility computing basis, so service providers bill based on the quantity of resources used.
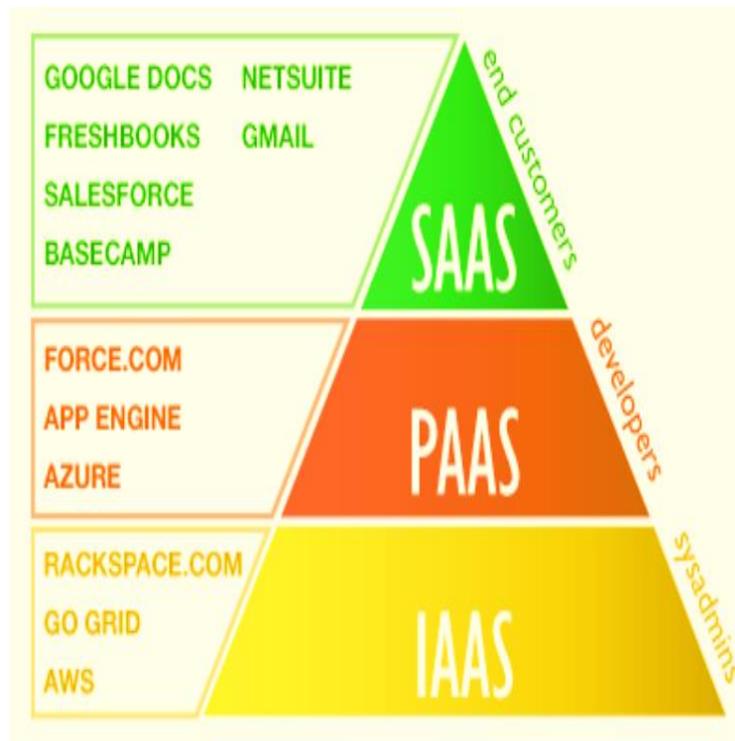

Figure 1 The Service Models of Cloud Computing

V. Deployment Model –

The NIST definition defines four deployment models

- **Public Cloud**-Clients can access public cloud services from a third-party service provider online. It can be used for nothing or for a low cost. Public cloud suppliers, like Google and Amazon, which make their services available to businesses and consumers online, often offer an access control mechanism for their users, so being in a public cloud does not mean that a user's data is publicly viewable.

- **Private Cloud**-It is also elastic and service-based, but unlike public clouds, data and processes are managed inside the company without being constrained by network bandwidth, security risks, or legal requirements. Private cloud services also give both the user and the supplier more control over the cloud infrastructure, enhancing security and resilience. It may be physically located outside of the organisation that uses it, and it is not required that they manage and host it, but they always maintain full control over the infrastructure.

- **Community Cloud**-It is controlled and used by a group of organizations that have shared interests, such as specific security requirements or a common mission. The members of the community share access to the data and applications in the cloud.

- **Hybrid Cloud-**: It combines a public cloud and a private cloud. In this model, users typically keep control of business-critical services and data while outsourcing non-business-critical data and processing to the public cloud. Applications requiring complex databases or synchronisation may not be suitable because it may add complexity to the distribution of applications across various environments, monitoring of the internal and external infrastructure involved, security, and privacy.
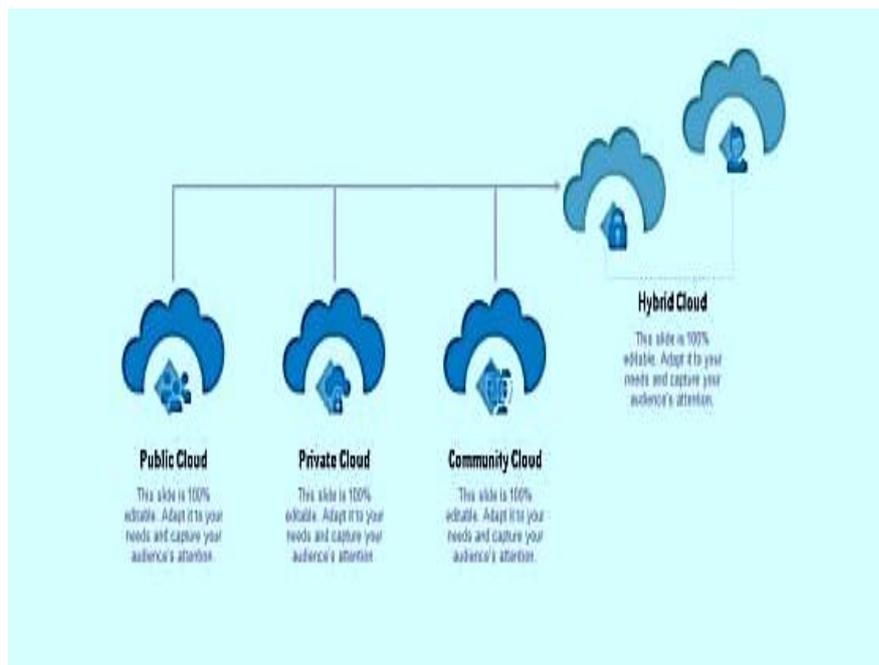

Figure 2 Deployment Model

VI.   Conclusion –

Cloud computing has gained considerable attention in recent times. It basically refers to an arrangement under which a user relies on another party to provide access to remote computer and software whose whereabouts, including their locations are neither known nor controllable by the user. From the cloud provider's view, the construction of very large datacentres at low cost sites using commodity computing, storage, and networking uncovered the possibility of selling those resources on a pay-as-you-go model below the costs of many medium-sized

datacentres, while making a profit by statistically multiplexing among a large group of customers.

The overview of cloud computing in this paper. It gives people a quick overview of the benefits and characteristic of cloud computing so they can decide if it's right for them. Despite some obstacles provided by cloud, we are confident that providers will overcome the difficulties of cloud computing in the long run and serve as a model for others to follow, perhaps by profitably utilizing the opportunities that correspond to those obstacles.

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