A Review of Cloud Computing Concepts, Architecture & Migration from On Premise to Off Premise Data Centres

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Abstract : Cloud computing provides computational infrastructure, storage, from audio to word processors and every type of application we can think of. Cloud computing allows any customer to be assigned the right resources on the spot For the construction of computer infrastructure, hardware, or software, the clients do not require any fees., which relieves them of their tremendous financial and mental burden. Clients only need to connect their devices to the network. Computers and networks can connect to cloud computing servers. In our research, we emphasised the importance of cloud computing. This article covers cloud computing architecture, cloud computing types, cloud computing services, and cloud computing offerings**.**

IndexTerms **- Cloud, Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS)**

I. INTRODUCTION

   Cloud in Cloud Computing refers to a web of networks, much like an original cloud where its constituents are the molecules of water. Users always have free access to cloud computing modality. In cloud computing, users typically choose an intermediate Internet service provider rather than setting up their own physical infrastructure. You are only responsible for paying for the services you use [2]. You can move your workload to the cloud to reduce your workload. As the cloud network takes over the load of the service, the load on the local computer is not too high when the application is running [1]. As a result, the amount of hardware and software users need is reduced.

   Cloud Network is a distributed architecture that provides services and resources as per needs and requirement. The resources (Computing) are now more widely available as a result of the internet's tremendous success in the modern times. As a result, the development of a new computer concept known as Cloud Computing has become possible. Traditional service providers must operate in two ways in the cloud computing environment.

II. TYPES OF CLOUDS

   The preliminary condition for segregating the entire cloud spectrum is usually based on the location of the clouds. Below fig is shown for the classifications of clouds:

Location based Cloud

   On the basis of a cloud's location, cloud computing is characterized in four different ways:

- **Public Cloud:** This Cloud is a paid utility which permits anyone to access and store the facts and figures over the cyberspace. The provider of the cloud operates the public cloud (CSP) computing resources. Examples of cloud computing platforms include Amazon Elastic Compute Cloud (EC2), Windows Azure Services Platform, and IBM Smart Cloud Enterprise [3]**.**
- **Private Cloud:** This Cloud has several names such as Corporate Cloud and Internal cloud. Diverse Organizations can opt this to build and run their own data centers. They may or may not take help from the third parties. They can use open-source tools for deployment purposes.
- **Hybrid Cloud:** Public and private clouds are integrated into hybrid clouds. Hybrid cloud = public cloud + private cloud, in other words. While anyone can access services running in a public cloud, services running in a private cloud [4] are only partially accessible to corporate users, so hybrid clouds are only partially secure**.** Google Apps, Office 365, and Amazon Web Services are among examples of the Hybrid Cloud.
- **Community Cloud:** It allows groups of multiple organizations to access systems and services to disseminate facts and figures among organizations and can also help in other scenarios such as dealing with a specific community. It is managed and operated by several community organizations, third parties, or a combination there of.[6] For example, consider the cloud-based healthcare community.
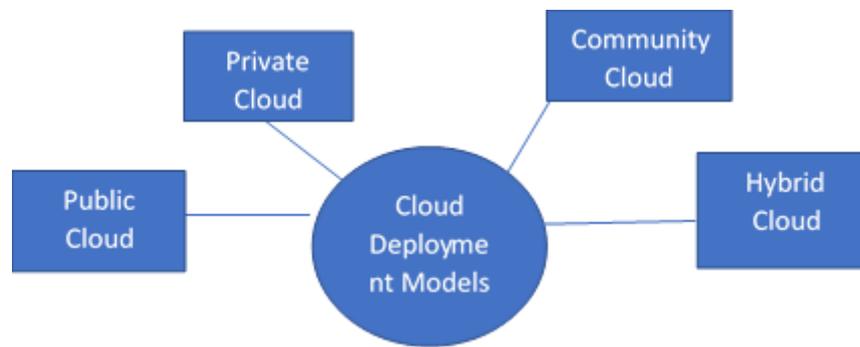
Fig.1 Types of Clouds

III. ARCHITECTURE OF CLOUD

The architecture of Cloud is made up of various constituents. Figure 2 illustrates the cloud computing architecture [7].
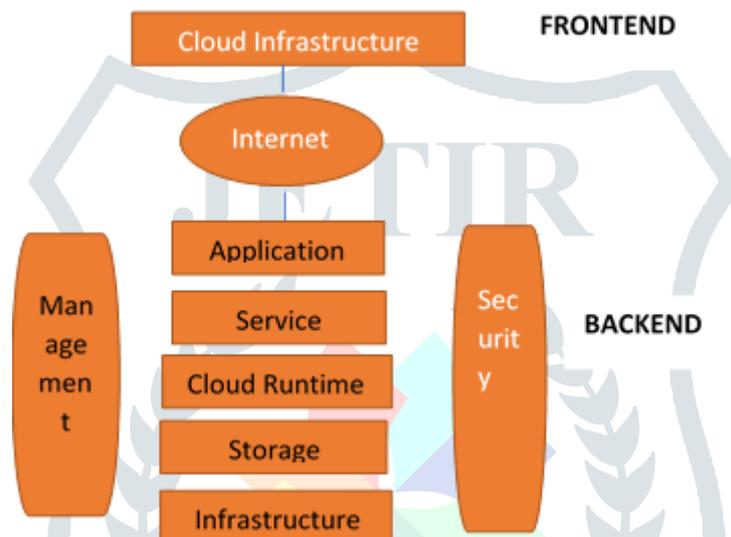

Fig.2 Architecture of Cloud

- **Front End:** The front end contains the client-side interface and program. The front end is the client's PC or remote computer network web server (Chrome, Firefox, Opera, etc.), and the client and mobile device, all completes the requirement.
- **Back End:** The backend permits the user in managing all of the resources required to provide the required services[8]. This section comprises of-
  - o Security System
  - o Data Storage Servers
  - o Virtual Machines
  - o Traffic Control Methods

A few of the crucial additives of cloud structure are illustrated below:-

- **Client Infrastructure:** It is a front-end component that provides a graphical user interface. It makes it easier for people to deal with the cloud.
- **Application:** All software or platforms that customers choose to use are applications.
- **Service:** Service components control the services that can be accessed based on the needs of the client.
- **Runtime Cloud:** It provides Virtual Machines with an execution & runtime environment.
- **Storage:** It is a crucial component of the architecture of the Cloud. Provides a large amount of cloud storage space for different data manipulation and operation functions.

IV. ISSUES & CHALLENGES ON PREMISE ARCHITECTURE

a. **Privacy and Security:** The main difficulty of cloud computing is tackling security concerns. The Elements of Enhanced Cryptography can be used to address the concerns of privacy and security. Data security is an important component that requires scrutiny. Enterprises hesitate to buy the promises of enterprise data security vendors. In many cases, the actual location is not disclosed, which raises the security concerns of the organization.[10] Firewalls between data centers protect this sensitive data in the current model.

b. **Portability:** Cloud faces the issue to quickly move apps from one provider to another. Vendor lock-in should be prohibited.

c. **Interoperability:** This issue addresses that platform-specific applications must be able to be used on diverse platforms. Online Services is a remedy for it but creating them is a difficult job.

d. **Calculating Results:** Low bandwidth does not provide the computing power required by cloud applications [12].

e. **Availability and dependability:** Cloud solutions need reliability and resilience, as most enterprises today rely on third-party services.

V. CLOUD SERVICES PROVIDERS AS A SOLUTION

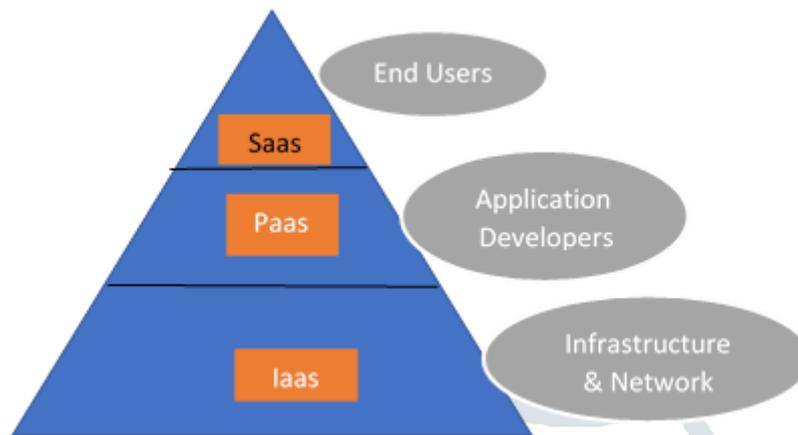Clouds are categorized as follows, based on the services they provide, as shown in the figure :

Fig.3 Cloud Services Models

- **Infrastructure as a Service (IaaS)**: With IaaS, Customers can outsource IT infrastructure such as servers, networks, processing, storage, and other resources to the company. Users use pay-as-you-go to access these resources over the Internet. Infrastructure providers are pay-as-you-go and host vast collections of computing resources such as servers, networks and data center spaces. Customers can take advantage of this type of service from providers such as Amazon Elastic Compute Cloud, Amazon S3 etc.
- **Platform as a Service (PaaS):** It is a cloud-based environment that allows you to build and distribute web-based applications without having to purchase or manage the required hardware, software, or hosting. Back-end scalability is controlled by the PaaS cloud service provider, so end users don't have to worry about infrastructure management.
- **Software as a service (SaaS):** It is a cloud-based service. You can use any software application or run your own apps and programs in the hosted and managed cloud. This is a software distribution model in which a cloud service provider hosts the service. These services are accessible to end users over the Cyberspace.

VI. SOLUTIONS FOR ON PREMISE TO AWS

Amazon Web Services (AWS) – It is a secure cloud service platform. To support the growth of the company, we provide services such as database storage, processing power, content delivery, relational database, basic email, and basic queuing.

AWS ON-PREMISE

- **Utilize variable capital expense instead of direct capital expense:** Instead of investing large amounts of money on-premises before consumers know how to use it, use variable capital spending instead. You can only pay for the time you use your computing resources.
- **Attain enormous economies:** Customers who use cloud computing can reap decrease variable expenses than they may on their own. Because the cloud aggregates the intake of loads of heaps of consumers, organizations like AWS may also reap extra economies of scale, ensuing in decreased pay-as-you-cross expenses.
- **Stop guessing about infrastructure capacity:** AWS helps remove guesswork from your infrastructure's capacity requirements. If a customer decides on capacity before launching an application, it will often be either expensive idle resources or limited capacity.
- **Rapidity and agility have improved:** In the AWS environment, new IT resources are available with a click. This means customers can reduce the time it takes to make changes. These materials are available to developers in minutes instead of weeks. This will increase the agility of the team.

VII. AWS CONSOLE

AWS continues to build a global infrastructure to ensure that our customers achieve lower latency, better performance, and their knowledge is stored only in the specified AWS Regions. As your organization grows, AWS can continue to provide the infrastructure that meets your global needs. AWS Regions and Availability Zones form the basis of your AWS cloud infrastructure. AWS Regions are physical locations with many Availability Zones located all over the world. Availability Zones are a collection of one or more discrete data centres, each having redundant power, networking, and appropriate storage in its own facility. Customers can work with production apps and databases in these Availability Zones [7,10].

VIII. AWS CONSOLE LIMITATIONS ON PREMISE

- **Difficult Service Setup:** Most AWS services provide enterprises with advanced capabilities, but they also require skills to deploy and support. Companies also need to be aware of service changes and developments.
- **Off-the-beaten-path upgrades and updates:** AWS is accustomed to changing services in the background and is unnoticed by the general public. As a result, significant changes can be overlooked.
- **Limited collaboration with open-source communities:** AWS is developing more and more open source solutions, but there is no adequate support for the open source community. But they recently started taking the opposite approach.
- **A seemingly exorbitant price:** The price may not be as cheap as it looks. Developing a unique solution that meets all your needs can be quite expensive.
- **Database compatibility issues:** Amazon's Aurora, Redshift, and DynamoDB are all AWS-only products.

IX. CONCLUSION

The provision of on-demand Internet services has increased significantly, and this trend is expected to continue. On-demand distribution of computing resources such as computing, storage, and software is called cloud computing. Customers are freed from significant financial and psychological stress by not having to pay for computer infrastructure development or hardware or software maintenance. Customers connect their PCs or networks to cloud computing servers and pay for services using simple payment mechanisms such as payperuse and subscriptions. This post emphasized the importance of cloud computing, cloud computing architecture, cloud types, and cloud services. For start-ups and small/medium-sized firms, this research is crucial. The AWS cloud, like any other technology, has its limitations. AWS Cloud, on the other hand, has recently began sharing its resources with open source groups in order to more quickly discover and resolve issues, resulting in a better user experience. The AWS cloud, on the other hand, provides more significant benefits than traditional data storage, as indicated in the research article.

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