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Cloud Computing: Just Fancy Name for Virtualization

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Abstract— Cloud computing is a technology that uses the internet and central remote server to maintain data and application. Cloud computing allows consumers and business to use application without installation and access their personal files at any computer without internet access. This technology allows for much more efficient computing by centralizing storage, memory, processing, and bandwidth. Simple examples of cloud computing are yahoo mail, Gmail. To get benefits of usage of software and hardware like sending mails etc., why should a consumer buy it? Just use and pay for that particular time period. At the same time, cloud computing platforms provide massive scalability, 99.999con- figure ability. These capabilities are provided at relatively low costs compared to dedicated infrastructures. Reducing costs, accelerating processing and simplify- in management are all vital to the success of an effective IT infrastructure. Companies are increasingly turning to more flexible IT environments to help them realize these goals, they are moving to cloud computing. If you are wondering what is so special about the" cloud" in cloud computing, here is the explanation. Traditionally, developer and architects used a picture of cloud to illustrate remote resource connected via the web. Eventually cloud became the logical connector between the local and remote resources on internet.

Keywords- **Cloud Computing, Cloud Storage, types, Cloud service, Green computing.**

I. INTRODUCTION

Cloud is the metaphor for the internet, based on the symbol used to represent the world wide network in computer network diagrams. Economically, the main appeal of cloud computing is that customers only use what they need ,and only pay for what they actually use. Resources are available to be accessed from the cloud at any time, and from any location via the internet. The actual storage location may even differ from day to day or even minute to minute, as the cloud dynamically manages available storage space. But even though the location is virtual, the users a static location for PC.

A. What is Cloud computing?

Cloud computing is an evolving paradigm which is enabling outsourcing of all IT needs such as storage, computation and software such as office and ERP, through large Internet. The shift toward such service-oriented computing is driven primarily by ease of management and administration process involving software upgrades and bug fixes. It also allows fast application development and testing for small IT companies that cannot afford large investments on infrastructure. Most important advantage offered by Clouds is in terms of economics of scale; that is, when thousands of users share same facility, cost per user and the server utilization. To enable such facilities, Cloud computing encompasses many technologies and concepts such as virtualization, utility computing, pay as you go, no capital investment, elasticity, scalability, provisioning on demand, and IT outsourcing.

B. Evolution of Cloud Computing

From the initial days of offering basic internet connectivity to offering soft- ware as a service, the ISPs have come a long way. ISP 1.0 was all about providing internet access to their customers. ISP 2.0 was the phase where ISPs offered hosting capabilities. The next step was co-location through which the ISPs started leasing out the rack space and bandwidth. By this, companies could host their servers running custom, Line of Business (LoB) applications that could be accessed over the web by its employees, trading partners and customers. ISP 3.0 was offering applications on subscription resulting in the Application Service Provider (ASP) model. The latest Software as a Service or is a mature ASP model. The next logical step for ISPs would to embrace the Cloud.

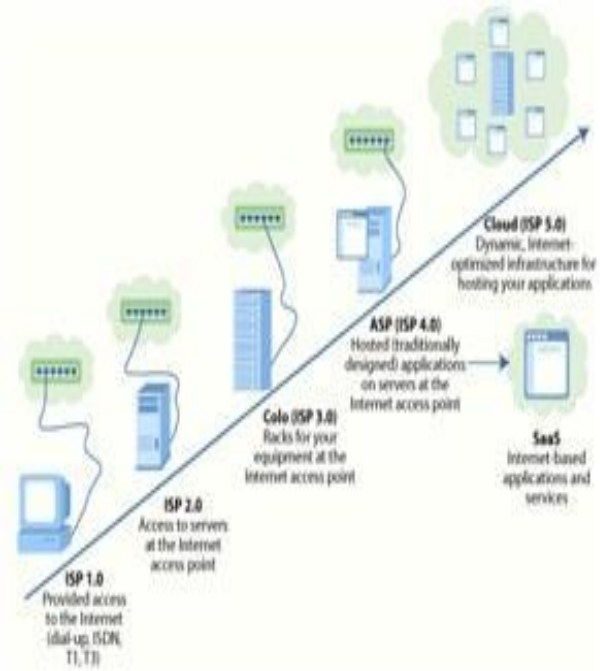

Fig 1: Evolution of Cloud Computing

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C. Cloud Computing Characteristics

The key characteristics exhibited by Clouds are shown in Figure.

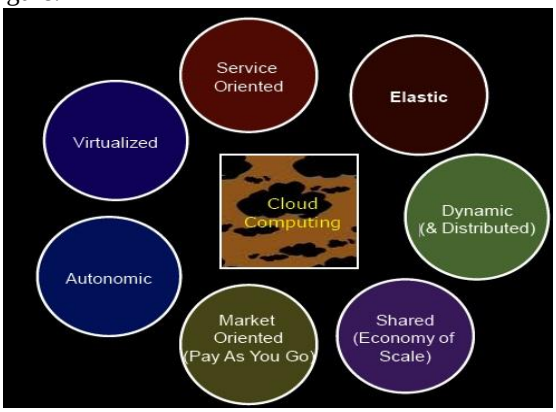

Fig 2: Characteristics of Cloud Computing

Virtualized:- Resources (i.e. compute, storage, and network capacity) in Clouds are virtualized and it is achieved at various levels including VM (Virtual Machine) and Platform levels. The most basic one is at Virtual Machine (VM) level where different applications can be executed within their containers or operating systems running on the same physical machine. Platform level enables seamless mapping of applications to one or more resources offered by different Cloud infrastructure providers.

Service-Oriented: Cloud is implemented using Service-Oriented Architecture model where all the capabilities/components are available over the network as a service. Whether it is platform or infrastructure everything is offered as a service.

Elastic: Resources (i.e. compute, storage, and network capacity) required for Cloud applications can be dynamically provisioned and varied i.e., increase or decrease at runtime depending on user QoS requirements. Major Cloud providers such as Amazon even provide services for automatic scale-out and scale-in based on hosted application requirements.

Dynamic and Distributed: Although Cloud resources are virtualized, they are often distributed to enable the delivery of high-performance and/or reliable Cloud services. These resources are flexible and can be adapted according to customer's requirements such as software, network configuration, etc.

Shared (Economy of Scale): Clouds are shared infrastructure where resources serve multiple customers with dynamic allocation according to their application's demand. This sharing model is also termed as "multi-tenant" model. In general, the customers neither have any direct control over physical resources nor they are aware of the resource location and with whom they are being shared.

Market-Oriented (Pay as you go):- In Cloud computing, customers pay for services on a pay-per-use (or pay-as-you-go) basis. The pricing model can vary depending on the QoS expectation of application. Cloud IaaS providers such as Amazon price resources using market models such as commodity or on-spot pricing models.

Autonomic:- To provide highly reliable services, Clouds exhibit autonomic behavior by managing themselves in case of failures or the performance degradation.

II. INFRASTRUCTURE MODEL

There are many considerations for cloud computing architects to make when moving from a standard enterprise application deployment model to one based on cloud computing. There are public and private clouds that offer complementary benefits, there are three basic service models to consider, and there is the value of open APIs versus proprietary ones. IT organizations can choose to deploy applications on public, private, or hybrid clouds, each of which has its trade-offs. The terms public, private and hybrid do not dictate location. While public clouds are typically out there" on the Internet and private clouds are typically located.

A. Types of Cloud

Public clouds:-Public clouds are run by third parties, and applications from different customers are likely to be mixed together on the cloud's servers, storage systems, and networks. Public clouds are most often hosted away from customer premises, and they provide away to reduce customer risk and cost by providing a flexible, even temporary extension to enterprise infrastructure.

Private clouds:-Private clouds are built for the exclusive use of one client, providing the utmost control over data, security, and quality of service. The company owns the infrastructure and has control over how applications are deployed on it. Private clouds may be deployed in an enterprise data center , and they also may be deployed at a collocation facility.

Hybrid clouds:-Hybrid clouds combine both public and private cloud models. They can help to provide on-demand, externally provisioned scale. The ability to augment a private cloud with the resources of a public cloud can be used to maintain service levels in the face of rapid workload fluctuations. A hybrid cloud also can be used to handle planned workload spikes. Sometimes called" surge computing" 'a public cloud can be used to perform periodic tasks that can be deployed easily on a public cloud.

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B. Architectural layers of Cloud Computing

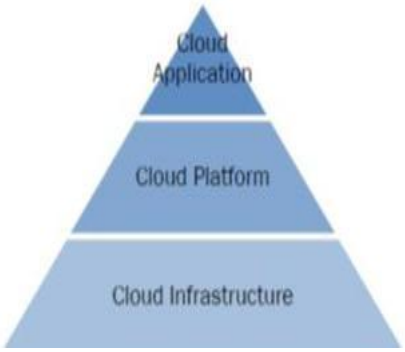

Fig 3: Deployment Models for Clouds Cloud computing can be visualized as a pyramid consisting of three sections

Infrastructure as a Service:-IPs manages a large set of computing resources, such as storing and processing capacity. Through virtualization, they are able to split, assign and dynamically resize these re-sources to build ad-hoc systems as demanded by customers, the SPs. They deploy the software stacks that scenario. Hardware and the Operating System (OS) are exposed as a Web Service over the public internet.

Platform as a Service:-Cloud systems can offer an additional abstraction level: instead of supplying a virtualized infrastructure, they can provide the software platform where systems run on. The sizing of the hardware resources demanded by the execution of the services is made in a transparent manner. This is denoted as Platform as a Service .A well-known example is the Google Apps Engine.

Storage as a Service:-Commonly known as Storage as a Service, it facilitates cloud applications to scale beyond their limited servers. It allows users to store their data at remote disks and access them any- time from any place .Cloud storage systems are expected to meet several rigorous requirements for maintaining users' data and information, including high availability, reliability, performance, replication and data consistency, but because of the conflicting nature of these requirements, no one system implements all of them together.

Software as a Service:-Finally, there are services of potential interest to a wide variety of users hosted in Cloud systems. This is an alternative to locally run applications .An example of this is the online alternatives of typical office applications such as word processors. This scenario is called Software as a Service.

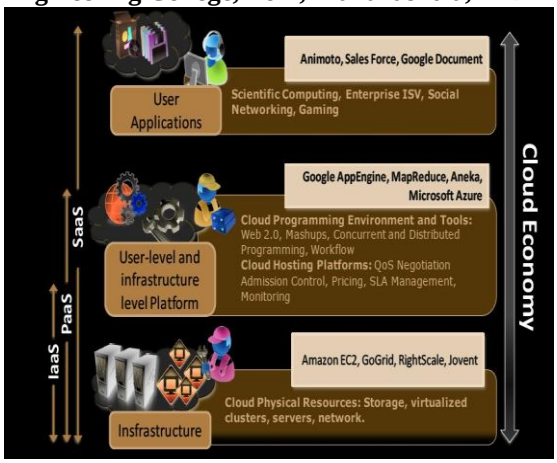

Fig 4: Cloud Computing Architecture

III. CLOUD STORAGE

Cloud Storage is a model of networked computer data storage where data is stored on multiple virtual servers, generally hosted by third parties, rather than being hosted on dedicated servers. Hosting companies operate large data centers; and people who require their data to be hosted buy or lease storage capacity from them and use it for their storage needs. The data center operators, in the background, virtualizes the resources according to the requirements of the customer and expose them as virtual servers, which the customers can themselves manage. Physically, the resource may span across multiple servers. The appeal of cloud storage is due to some of the same attributes that define other cloud services: pay as you go, the illusion of infinite capacity (elasticity), and the simplicity of use/management. It is therefore important that any interface for cloud storage support these attributes, while allowing for a multitude of business cases and offerings, long into the future. The model created and published by the Storage Networking Industry Association, shows multiple types of cloud data storage interfaces able to support both legacy and new applications.

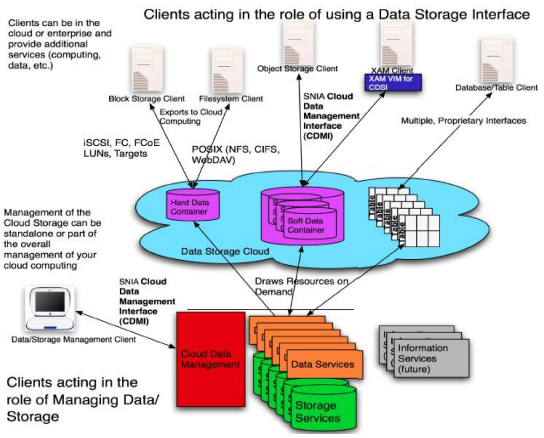

Fig 5: Cloud Storage Architecture

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All of the interfaces allow storage to be provided on demand, drawn from a pool of resources. The capacity is drawn from a pool of storage capacity provided by storage services. The data services are applied to individual data elements as determined by the data system meta data. Meta data specifies the data requirements on the basis of individual data elements or on groups of data elements (containers). Interface (CDMI) is the functional interface that applications will use to create, retrieve, update and delete data elements from the cloud. As part of this interface the client will be able to discover the capabilities of the cloud storage offering and use this interface to manage containers and the data that is placed in them. In addition, meta data can be set on containers and their contained data elements through this interface. It is expected that the interface will be able to be implemented by the majority of existing cloud storage offerings to day. This can be done with an adapter to their existing proprietary interface, or by implementing the interface directly. In addition, existing client libraries such as XAM can be adapted to this interface This interface is also used by administrative and management applications to manage containers, accounts, security access and monitoring/billing information, even for storage that is accessible by other protocols. The capabilities of the underlying storage and data services are exposed so that clients can understand the offering. Conformant cloud offerings may offer a subset of either interface as long as they expose the limitations in the capabilities part of the interface.

IV. CLOUD DEVELOPERS

A. Cloud Developers

Amazon: Amazon was one of the first companies to offer cloud services to the public, and they are very sophisticated. Amazon offers a number of cloud services, including

(a) Elastic Computer Cloud (EC2) Offers virtual machines and extra CPU Cycles for your organization.

(b) Simple Storage Service (S3) allows you to store items up to 5GB in size in Amazons virtual storage service.

(c) Simple Queue Service (SQS) allows your machines to talk to each other using this message-passing API.

(d) Simple DB A web service for running queries on structured data in real time.

This service works in close conjunction with Amazon Simple Storage Service (Amazon S3) and Amazon Elastic Compute Cloud (Amazon EC2), collectively providing the ability to store, process, and query data sets in the cloud. These services can be difficult to use, because they have to be done through the command line. That said, if you are used to working in a command-line environment, you should not have much trouble using the services.

Amazons virtual machines are versions of Linux distributions, so those who are experienced with Linux will be right at home. In fact, applications can be written on your own machine and then uploaded to the cloud. Amazon is the most extensive cloud service to date. You can see more about. Amazons cloud services at http://aws.amazon.com.

Google: In stark contrast to Amazons offerings is Google App Engine. On Amazon you get root privileges, but on App Engine, you can't write a file in your own directory. Google removed the file write feature out of Python as a security measure, and to store data you must use Google database. Google offers online documents and spread sheets, and encourages developers to build features for those and other online software, using its Google App Engine. Google reduced the web applications to a core set of features, and built a good frame work for delivering them. Google also offers handy debugging features. Groups and individuals will likely get the most out of App Engine by writing a layer of Python that sits between the user and the database. Look for Google to add more features to add back ground processing services. It can be found online at code. (google.com/app engine/.)

Microsoft: Microsoft cloud computing solution is called Windows Azure, an operating system that allows organizations to run Windows applications and store files and data using Microsoft data center. It is also offering its Azure Services Platform, which are services that allow developers to establish user identities, manage work flows, synchronize data, and perform other functions as they build software programs on Microsoft online computing platform. Key components of Azure Services Platform include

(a) Windows Azure Provides service hosting and management and low- level scalable storage, computation, and networking.

(b) Microsoft SQL Services Provides database services and reporting.

(c) Microsoft .NET Services Provides service-based implementationsof.NET Framework concepts such as workflow.

(d) Live Services Used to share, store, and synchronize documents, photos, and files across PCs, phones, PC applications, and websites.(e) Microsoft Share Point Services and Microsoft Dynamics CRM Services Used for business content, collaboration, and solution development in the cloud.

Microsoft plans the next version of Office to offer a browser based option so that users can read and edit documents online as well as offer the ability for users to collaborate using web, mobile, and client versions of Office. Microsoft is a little late to the cloud party and is not a leader in cloud computing.

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That honor goes to Google and Amazon, and more and more companies are offering cloud services, so if Microsoft wants to stay competitive, they going to have to pick up the pace. Microsoft cloud offerings can be found online at www.microsoft.com/azure/defaultmspx. For some, the term cloud computing is simply hype. But for others who want to embrace it, cloud computing is a great way for IT professionals to focus less on their data centers, and more on the work of information technology.

V.GREEN CLOUD

Cloud computing business potential and contribution to already aggravating carbon emission from ICT, has lead to a series of discussion whether Cloud computing is really green. It is forecasted that the environmental footprint from data centers will triple between 2002 and 2020, which is currently 7.8 billion tons of CO2 per year. There are reports on Green IT analysis of Clouds and datacenters that show that Cloud computing is "Green", while others show that it will lead to alarming increase in Carbon emission. Thus, in this chapter, we first analyzed the benefits offered by Cloud computing by studying its fundamental definitions and benefits, the services it offers to end users, and its deployment model. Then, we discussed the components of Clouds that contribute to carbon emission and the features of Clouds that make it "Green". We also discussed several research efforts and technologies that increase the energy efficiency of various aspects of Clouds. For this study, we identified several unexplored areas that can help in maximizing the energy efficiency of Clouds from a holistic perspective. After analyzing the shortcoming of previous solutions, we proposed a Green Cloud Framework and presented some results for its validation.

Green Cloud Architecture:-

The Green Cloud framework is designed such that it keeps track of overall energy usage of serving a user request.

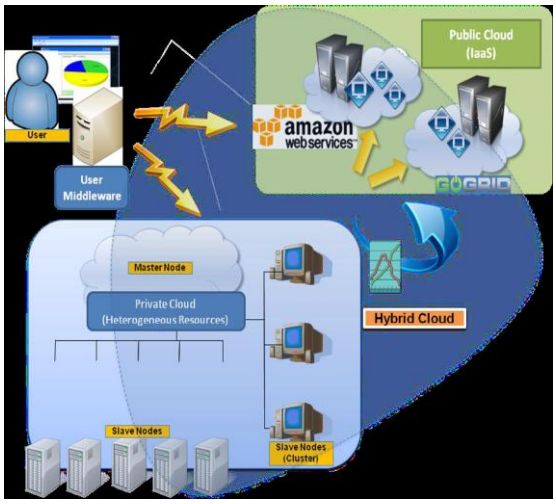

Fig 6: Green Cloud Architecture

It relies on two main components, Carbon Emission Directory and Green Cloud offers, which keep track of energy efficiency of each Cloud provider and also give incentive to Cloud providers to make their service "Green". From user side, the Green Broker plays a crucial role in monitoring and selecting the Cloud services based on the user QoS requirements, and ensuring minimum carbon emission for serving a user. In general, a user can use Cloud to access any of these three types of services (SaaS, PaaS, and IaaS), and therefore process of serving them should also be energy efficient. In other words, from the Cloud provider side, each Cloud layer needs to be "Green" conscious.

VI. ADVANTAGES & DISADVANTAGES

A. Advantages

With everything, as has been said before, the devil is in the details. Growing popularity of cloud storage and valid business reasons for its popularity. Here are five key benefits of using cloud storage and of applications that take advantage of storage in the cloud.

Ease of management: Applications that take advantage of storage in the cloud are often far easier to set up and maintain than deploying an equivalent service on premise. At the customer site, often all that is needed to manage your storage implementation is a simple web browser leaving the headaches to the service provider.

Cost effectiveness: For total cost of ownership, cloud storage is a clear winner. Elimination of the costly systems and the people required to maintain them typically provides organizations with significant cost savings that more than offset the fees for cloud storage.

Lower impact out ages and upgrades: Typically cloud computing provides cost effective redundancies in storage hardware. This translates in to uninterrupted service during a planned or unplanned outage. This is also true for hardware upgrades which for the end user will no longer be visible.

B. Disadvantages

However, with every type of cloud storage, there are challenges in the implementation (i.e. the devil is in the details). These challenges include:

Security: Always an issue and not necessarily a cloud storage specific issue.

Power: Since you have copies you will have extra storage which adds power.

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Replication time and costs: How fast can you replicate data since this can be important to data resiliency.

Cost: How much extra money do you have to pay to buy the extra storage for copies.

VII. CONCLUSION AND FUTURE SCOPE

In today's global competitive market, companies must innovate and get the most from its resources to succeed. This requires enabling its employees, business partners, and users with the platforms and collaboration tools that promote innovation. Cloud computing infrastructures are next generation platforms that can provide tremendous value to companies of any size. They can help companies achieve more efficient use of their IT hardware and software investments and provide a means to accelerate the adoption of innovations.

1. Media + entertainment
2. Social/collaboration
3. Mobile/location
4. E-commerce/payments

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