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An Introduction to Cloud Computing With Reference To Service Provided By the Cloud, Cloud Performance and Benchmarks

Priya R.Lodha[1], Mr. Avinash P.Wadhe[2]
[1] M.E. (II Sem) (CSE) G.H.Raisoni College of Engineering &Management Amravati, India
[2]MTech (CSE) G.H.Raisoni College of Engineering &Management Amravati, India

Abstract:- Cloud computing is an emerging technology in which the research community and industries have recently embarked. However, the infrastructures of most cloud computing systems today are invisible to the research community, or are not explicitly designed to the researchers interested in cloud computing systems. In this paper we have describe the cloud computing Environment, the different types of services, deployment models and platforms provided by the cloud, the security architecture, and the application areas. The basic concept of the cloud environment in the World Wide Web is briefly described with reference to the other service provider. Cloud computing and cloud services bring new ways of thinking about computing architecture and delivery models. With cloud, everything becomes a service so that companies can create new initiatives without a massive upfront investment. Cloud computing offers new and unique business benefits and will help change the way businesses collaborate, operate, and compete.

Keywords:- Cloud Computing, Deployment models, Service models, Performance benchmarks, Distributed paradigm

I. INTRODUCTION

Cloud Computing is everywhere. Cloud computing is receiving a great deal of attention, both in publications and among users, from individuals at home to the U.S. government. Cloud computing is a subscription-based service where you can obtain networked storage space and computer resources. One way to think of cloud computing is to consider your experience with email. Your email client, if it is Yahoo!, Gmail, Hotmail, and so on, takes care of housing all of the hardware and software necessary to support your personal email account. Cloud computing as a computing model, not a technology. In this model "customers" plug into the "cloud" to access IT resources which are priced and provided "on-demand". Thus, Cloud Computing is simply IT services sold and delivered over the Internet.

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.

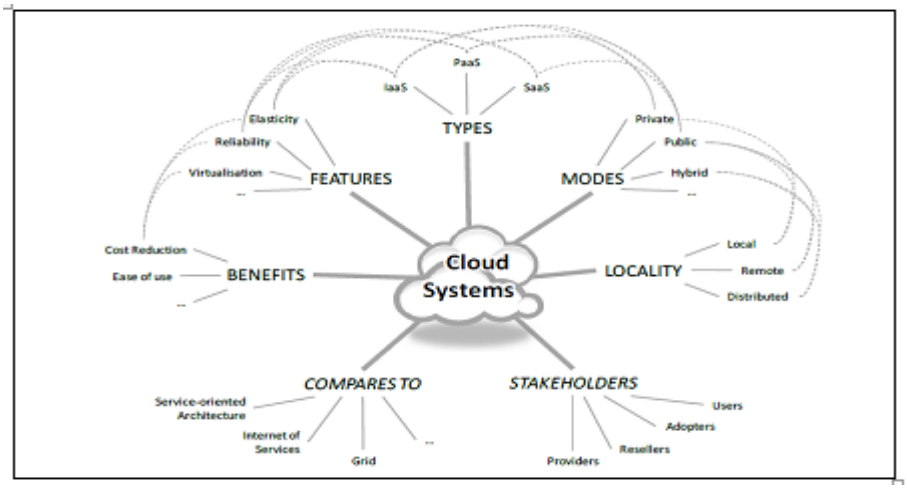

Figure1. The Cloud System

II. HOW CAN YOU USE THE CLOUD?

The cloud makes it possible for you to access your information from anywhere at any time. While a traditional computer setup requires you to be in the same location as your data storage device, the cloud takes away that step. The cloud removes the need for you to be in the same physical location as the hardware that stores your data. Your cloud provider can both own and house the hardware and software necessary to run your home or business applications. This is especially helpful for businesses that cannot afford the same amount of hardware and storage space as a bigger company. Small companies can store their information in the cloud, removing the cost of purchasing and storing memory devices.

Additionally, because you only need to buy the amount of storage space you will use, a business can purchase more space or reduce their subscription as their business grows or as they find they need less storage space. One requirement is that you need to have an internet connection in order to access the cloud.

III. DEPLOYMENT MODELS IN CLOUD COMPUTING

There are different types of clouds that you can subscribe to depending on your needs. As a home user or small business owner, you will most likely use public cloud services.

1.1 Public Cloud

A public cloud can be accessed by any subscriber with an internet connection and access to the cloud space. The term "public" does not always mean free, even though it can be free or fairly inexpensive to use. A public cloud does not mean that a user's data is publically visible; public cloud vendors typically provide an access control mechanism for their users. Public clouds provide an elastic, cost effective means to deploy solutions. It Enterprises may use cloud functionality from others, respectively offer their own services to users outside of the company. Providing the user with the actual capability to exploit the cloud features for his / her own purposes also allows other enterprises to outsource their services to such cloud providers,

Example: Amazon, Google Apps, Windows Azure.

1.2 Private Cloud

A private cloud is established for a specific group or organization and limits access to just that group. A private cloud offers many of the benefits of a public cloud computing environment, such as being elastic and service based. The difference between a private cloud and a public cloud is that in a private cloud-based service, data and processes are managed within the organization without the restrictions of network bandwidth, security exposures and legal requirements that using public cloud services might entail. In addition, private cloud services offer the provider and the user greater control of the cloud infrastructure, improving security and resiliency because user access and the networks used are restricted and designated are typically owned by the respective enterprise and / or leased. Functionalities are not directly exposed to the customer, though in some cases services with cloud enhanced features may be offered – this is similar to (Cloud) Software as a Service from the customer point of view.

Example: eBay.

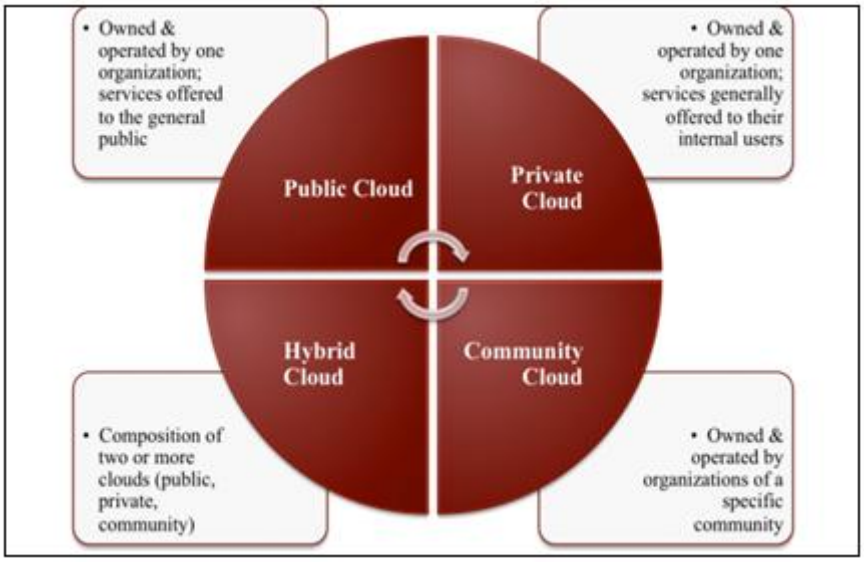

Figure2. Types of Cloud

1.3 Community Cloud

A community cloud is shared among two or more organizations that have similar cloud requirements, 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.

Typically cloud systems are restricted to the local infrastructure, i.e. providers of public clouds offer their own infrastructure to customers. Though the provider could actually resell the infrastructure of another provider, clouds do not aggregate infrastructures to build up larger, cross-boundary structures. In particular smaller SMEs could profit from community clouds to which different entities contribute with their respective (smaller) infrastructure.

Community clouds can either aggregate public clouds or dedicated resource infrastructures. We may thereby distinguish between private and public community clouds. For example smaller organizations may come together only to pool their resources for building a private community cloud. As opposed to this, resellers such as Zimory may pool cloud resources from different providers and resell them.

1.4 Hybrid Cloud

Hybrid clouds consist of a mixed employment of private and public cloud infrastructures so as to achieve a maximum of cost reduction through outsourcing whilst maintaining the desired degree of control over e.g. sensitive data by employing local private clouds.

In this model users typically outsource nonbusiness-critical information and processing to the public cloud, while keeping business-critical services and data in their control. There are not many hybrid clouds actually in use today, though initial initiatives such as the one by IBM and Juniper already introduce base technologies for their realization [11].

IV. HOW DOES IT WORK?

In traditional enterprise computing, IT departments forecast demand for applications and capacity and invest time and money to develop those resources in-house or purchase them from others and operate them in-house. With cloud computing, institutions procure IT services from remote providers, and campus constituents access these resources over the Internet. E-mail, for example, long considered a staple of an institution's IT operations, can be obtained from a range of sources, and a growing number of campuses contract with outside suppliers for this function. Software is hosted by the provider and does not need to be installed—or maintained on individual computers around campus. In some cases, a large university or a consortium might become a provider of cloud services. Storage and processing needs can also be met by the cloud.

Institutions pay only for the resources used, and users can access the applications and files they need from virtually any Internet-connected computer. In a mature cloud computing environment, institutions would be able to add new IT services or respond to changes in capacity on the fly, saving capital costs that can be redirected to programs of strategic value to the institution.

V. SECURITY IN CLOUD COMPUTING

The information housed on the cloud is often seen as valuable to individuals with malicious intent. There is a lot of personal information and potentially secure data that people store on their computers, and this information is now being transferred to the cloud. This makes it critical for you to understand the security measures that your cloud provider has in place, and it is equally important to take personal precautions to secure your data.

The first thing you must look into is the security measures that your cloud provider already has in place. These vary from provider to provider and among the various types of clouds. What encryption methods do the providers have in place? What methods of protection do they have in place for the actual hardware that your data will be stored on? Will they have backups of my data? Do they have firewalls set up?

There also needs to be the right level of access control within the cloud environment to protect the security of resources. There needs to be a comprehensive security infrastructure provided at all levels and types of cloud services. Developers also need tools that allow them to secure the services they design to be delivered in the cloud. Organizations need consistent security across their own data center environments that intersect with a cloud service.

From the point of view of the technology, the security of user data can be reflected in the following rules of implementation:

1. The privacy of user storage data. User storage data cannot be viewed or changed by other people (including the operator).
2. The user data privacy at runtime. User data cannot be viewed or changed by other people at runtime (loaded to system memory).
3. The privacy when transferring user data through network. It includes the security of transferring data in

cloud computing center intranet and internet. It cannot be viewed or changed by other people.

4. Authentication and authorization needed for users to access their data. Users can access their data through the right way and can authorize other users to access.

VI. SERVICE MODELS IN CLOUD COMPUTING

1.5 SaaS (Software as a Service)

It is the most widely known and widely used form of cloud computing. It provides all the functions of a sophisticated traditional application to many customers and often thousands of users, but through a Web browser, not a "locally-installed" application. Little or no code is running on the Users local computer and the applications are usually tailored to fulfill specific functions. SaaS eliminates customer worries about application servers, storage, application development and related, common concerns of IT. Highest-profile examples are Salesforce.com, Google's Gmail and Apps, instant messaging from AOL, Yahoo and Google, and VoIP from Vonage and Skype.

1.6 PaaS (Platform as a Service)

Delivers virtualized servers on which customers can run existing applications or develop new ones without having to worry about maintaining the operating systems, server hardware, load balancing or computing capacity. These vendors provide APIs or development platforms to create and run applications in the cloud – e.g. using the Internet. Managed Service providers with application services provided to IT departments to monitor systems and downstream applications such as virus scanning for e-mail are frequently included in this category. Well known providers would include Microsoft's Azure, Salesforce's Force.com, Google Maps, ADP Payroll processing, and US Postal Service offerings.

1.7 IaaS (Infrastructure as a Service)

Delivers utility computing capability, typically as raw virtual servers, on demand that customers configure and manage. Here Cloud Computing provides grids or clusters or virtualized servers, networks, storage and systems software, usually (but not always) in a multitenant architecture. IaaS is designed to augment or replace the functions of an entire data center. This saves cost (time and expense) of capital equipment deployment but does not reduce cost of configuration, integration or management and these tasks must be performed remotely. Vendors would include Amazon.com (Elastic Compute Cloud [EC2] and Simple Storage), IBM and other traditional IT vendors.

1.8 Cloud Performance and Benchmarks

Recent research efforts have conducted in-depth performance analysis on the virtual machine instances offered by public cloud providers. For example, Stantchev et al. [14] introduce a generic benchmark to evaluate the nonfunctional properties (e.g., response time) of individual cloud offerings for web services from cost-benefit perspective.

Dejun etal. [19] and Schad et al. [20] examine the performance stability and homogeneity aspects of VM instances over time. These studies are useful to understand the underlying performance characteristics of the cloud infrastructure; however they do not consider the responsiveness of the platform during scaling with the variation in workload demand. A group at HP Labs [1] has defined provider-done measurements for a range of quality features of cloud platforms, focusing on environmental factors such as energy use.

Cloud service providers adopt dynamic VM migration strategies to balance application workloads among different physical machines. Several groups [13, 6] have presented benchmarking solutions to quantify the comparison of live VM migration techniques for data center scenarios. We evaluate cloud platform's elasticity from the consumers' viewpoint, whereas their work takes the service providers' perspective. They define a set of performance measures for assessing the overheads associated with dynamic VM migration techniques. In contrast, we consider the impact of imperfect elasticity based on consumers' business situation.

Several performance benchmarks have been proposed to quantify many important cloud performance metrics, among them the resource spin-up (spin-down) delay. Yigitbasi etal. [16] present a framework to determine the performance overheads associated with the scaling latency of the virtual machine (VM) instances in the cloud. Lietal. [9] developed CloudCmp to analyse customer perceived performance and cost effectiveness (e.g., scaling latency, cost per operation) of public cloud offerings. However, they do not combine their discrete performance metrics into a macroscopic overview of the platform's adaptability behavior. We propose a single summary measure for elasticity, which is influenced by several factors that were used in these earlier studies.
Yahoo! Cloud Serving Benchmark (YCSB) [4] evaluates performance of cloud databases (e.g., Cassandra, HBase) under load for a variety of workload scenarios as well as scale-up and elastic speed-up measures (that is, they consider workloads that grow and grow). Their work is valuable when seeking to analyse the performance

implications of large database-intensive applications in the cloud; how-ever, we also consider de-provisioning and resource granularity aspects.

VII. CLOUD COMPUTING PLATFORMS

Industry analysts have made bullish projections on how Cloud computing will transform the entire computing industry.

7.1 Microsoft's Windows Azure platform

Microsoft's Windows Azure platform is a group of cloud technologies, each providing a specific set of services to application developers. This platform can be used both by applications running in the cloud and by applications running on local systems [1]. It contains the following components and is shown in Figure.

Figure3. Microsoft's Windows Azure platform

1) Windows Azure: A Windows-based environment for running applications in Microsoft data centers.
2) SQL Azure: SQL Server based data services.
3) .NET Services: Distributed infrastructure services to cloud-based and local applications.

1) Windows Azure

Windows Azure runs on a large number of machines, all located in Microsoft data centers and accessible via the Internet. A common Windows Azure fabric knits this plethora of processing power into a unified whole. Windows Azure compute and storage services are built on top of this fabric.

2) SQL Azure

SQL Azure will eventually include a range of dataoriented capabilities, including reporting, data analytics, and others, the first SQL Azure components to appear are SQL Azure Database and "Huron"Data Sync.

a) SQL Azure Database: Unlike the Windows Azure storage service, SQL Azure Database is built on Microsoft SQL Server.

b) "Huron" Data Sync: "Huron" Data Sync.technology synchronizes relational data across various on-premises DBMSs. The owners of that data can determine what should be synchronized, how conflicts should be handled, and more.

3) Net Services

.NET Services provides cloud-based infrastructure services that can be used by either on-premises applications or cloud applications. It includes Access Control and Service Bus. Service Bus provides a mechanism to manage Web services exposed by applications.[2]

7.2 Amazon Web Services for Cloud Competing

Amazon Web Services (AWS) for Cloud Competing provides a highly scalable cloud computing platform which is high availability and dependability, and the flexibility to enable customers to build a wide range of applications [16]. Amazon Web Services for Cloud Competing contains the following components.

1) Amazon Elastic Compute Cloud (EC2)

Amazon Elastic Compute Cloud (Amazon EC2) shown in Figure 2 is a web service that enables customers to launch and manage Linux/UNIX/Windows server instances in the data centers of Amazon.

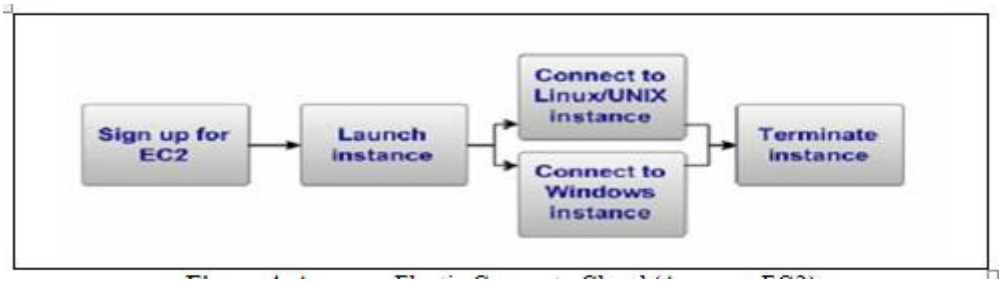

Figure 4. Amazon Elastic Compute Cloud (Amazon EC2)

Amazon EC2 provides the following major features:

- Resource delivered as AMI (Amazon Machine Image).
- Compute instance.
- Explicit access control

2) Amazon Simple Storage Service (S3)

Amazon S3 enables people to upload, store, and download data via the Internet. The data can be used in conjunction with other AWS services, e.g. EC2, Amazon Import/Export, and Amazon Elastic MapReduce. The features of Amazon S3 are listed as follows.

- Flat object storage model with key.
- Bucket as object container.
- Establish connection.
- Create bucket.
- Upload file.

7.3 Google Cloud

1) Google Engine

Other than supporting the Python standard library, Google App Engine also supports Application Programming Interfaces (APIs) for the datastore, Google 164 Accounts, URL fetch, image manipulation, and email services [8].

2) Google Apps

Google Apps is one of the most sophisticated and comprehensive collaborative products available. The program includes applications for email, calendars, instant messaging, room reservations, document storage and editing and video sharing.

3) Google File system (GFS)

GFS provides a reliable distributed storage system that can grow to petabyte scale by keeping data in 64-megabyte "chunks" stored on disks spread across thousands of machines. Each chunk is replicated, usually 3 times, on different machines so GFS can recover seamlessly from disk or machine failure. Figure shows its Architecture.[4][9]

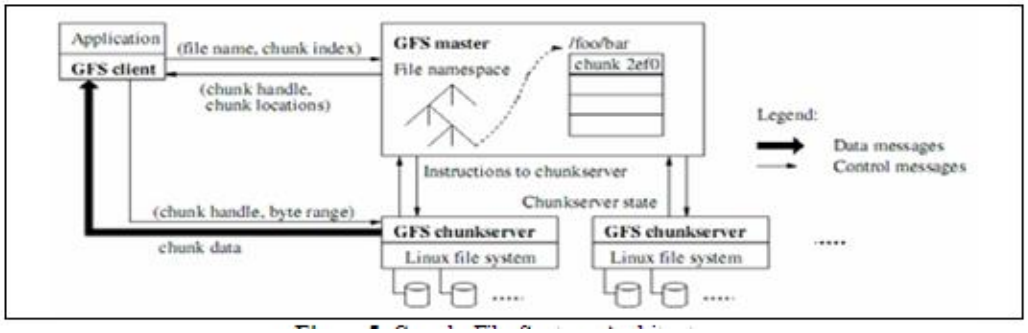

Figure5. Google File System Architecture.

VIII. CONCLUSION

In this paper, we have proposed Cloud computing paradigm from a variety of aspects, such as definitions, features, and technologies. Moreover, we have illustrated several representative platforms for the state-of-the-art Cloud computing. The cloud provides many options for the everyday computer user as well as large and small businesses. It opens up the world of computing to a broader range of uses and increases the ease of use by giving access through any internet connection. However, with this increased ease also come drawbacks. You have less control over who has access to your information and little to no knowledge of where it is stored. You also must be aware of the security risks of having data stored on the cloud. The cloud is a big target for malicious individuals and may have disadvantages because it can be accessed through an unsecured internet connection.

If you are considering using the cloud, be certain that you identify what information you will be putting out in the cloud, which will have access to that information, and what you will need to make sure it is protected. Additionally, know your options in terms of what type of cloud will be best for your needs, what type of provider will be most useful to you, and what the reputation and responsibilities of the providers you are considering are before you sign up.

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AUTHOR'S PROFILE

Miss. Priya R. Lodha is doing M.E (CSE) from G.H Raisoni College of Engineering and Management Amravati and has done B.E in Information Technology from SGBAU, Amravati.

Prof. Avinash P. Wadhe: Received the B.E and from SGBAU Amravati university and M-Tech (CSE) From G.H Raisoni College of Engineering, Nagpur (an Autonomous Institute). He is currently an Assistant Professor with the G.H Raisoni College of Engineering and Management, Amravati SGBAU Amravati university. His research interest include Network Security, Data mining and Fuzzy system .He has contributed to more than 20 research paper. He had awarded with young investigator award in international conference.