Cloud Computing: A Systematic Review of Types, Services, Usage and Models

Anil Kumar Gupta

Asst. Professor, Department of B.C.A, Chatra College, Chatra (A constituent unit of Vinoba Bhave University, Hazaribag)

ABSTRACT—In the present scenario the technologies like parallel computing, distributed computing, grid computing and along with all new concept has been developed termed as cloud computing. It aims to share data, calculations, and services transparently among users of a massive grid. It became a hot issue for its advantages such as "reduce costs", "increase business flexibility" and/or "provide business continuity". In this paper, we described what is cloud computing by considering the basic concept and architecture of cloud computing, along with the basic architecture the platforms, vendors of cloud and advantages of cloud computing is being discussed.

KEYWORDS—*Cloud Computing, IaaS, PaaS, SaaS, Platform, Service.*

I. INTRODUCTION

In the last five years the researchers have worked a lot over the concept of cloud computing and also considered the facts or issues related to the segment. In the case of the cloud computing which provides various list of services for the clients like service, platform, software, etc. the list of services is for the users who are online or are using the internet which is also termed as the internet-based system development. The services provided by the cloud computing are like SaaS, different infrastructure over the web and other web related technologies. Just because of the list and quality of services over cloud for the internet users. The paper completely summarizes the facts and issues while the development of the cloud and its services are described or are summarized for the better understanding of the concept. Cloud computing offers a file system termed as GFS which is being used for the better handling of the large files or documents where the system is having the chunks of varied sizes. The system also carries the enhancement in implementation for the better improvement of the results of the designed system and also the work describes the related issues of the system. The system also provides the text mining concept for the final application and also specific implementation tools for the domains [1].

Cloud computing is being defined as the concept of hosting the different services and platforms over the internet. The different services offered by the cloud computing are largely considered by the business community reason being that it makes the things requirement free for platforms or any other. The cloud computing can be considered by any of the business community like by small enterprises or big organizations. The cloud computing has provided many of the opportunities for the IT sector as there are many issues related to the concept which needs enhancement. The paper presents the definition of the cloud computing along with key concepts of the same and also have considered the state of art implementation and also the architectural principles. The work presented in the paper provides the better understanding of the issues and challenges for the design, development and usage of the cloud computing [2].

In the tradition style of the working or computing the software and applications related to any of the task is needed to be stored in the local system for the better and efficient running of the services. On the other hand, the cloud computing provides the required environment for the different services for the client or user of the internet. The cloud computing is being used for the purpose of data storage over internet, sharing of the infrastructure, etc. for the individual and also for business clients. The accessibility to the internet hasprovided the facility of the movement of the applications over the internet. This is all explained by Lew Tucker, Vice President and Chief Technology Officer of cloud computing at Sun Microsystems. A growing interdependent is created by using cloud services in public as well as private sector. [3]

Cloud computing is being considered as the new concept of its type. The word cloud was considered in the fourth season, 2007 [4], which has been considered as the long-held dream in the field, the cloud computing has the ability to transform the larger part of the IT segment, the concept of cloud computing has the capability to change the way the software, application buying, and renting is being considered. The researchers with good and novel ideas now need not to consider high investment over the deployment of the infrastructure required for their service to start and also has reduced the human interference costing.

This paper Section 2 describes the definition, concept, key features and characteristics of cloud computing. In Section 3 different types of cloud computing techniques, section 4 considers different platforms of cloud computing, section 5 describes the architecture of cloud computing and section 6 describes the advantages of cloud computing. Some example of cloud computing vendors are illustrated in the work.

II. CONCEPT OF CLOUD COMPUTING

The term cloud computing has been defined by many of the researchers in various formats [3]. On the basis of what the cloud computing can provide to the customer, the paper defines the various definitions of the cloud computing [5].

"Cloud computing is being defined as the kind of parallel and distributed system where is system is the interconnection of various computers which are dynamic and virtualized for the service level agreement which is in between the client and the provider of the service."

In the case when it is technically considered then it is being defined as the group of clusters and grids. Clouds are also being defined as the data centers which can also be stated as of next generation connected through nodes where the hypervisor kind of things are being used like VMs, dynamically provisioned, cloud is also being used as the resources which are personalized for meeting the requirements of the clients or of market. Things over cloud are considered through negotiation and can be accessed via web.

The cloud computing is also being defined as the delivery of different applications as service and also providing the hardware configuration and other related infrastructure as a service as a datacenter. In the case when the service is being provided by the cloud then it is termed as the SaaS. The clouds datacenters and related hardware is being defined as cloud. The cloud is available for the use for the clients in the manner of pay-as-you-go, which is being termed as the public cloud and the considered service is being termed as the utility computing. The term private computing is being defined as the datacenter of any individual and organization where the cloud is not being made available for the public sharing. Hence the cloud computing can be defined as integration of SaaS and utility computing but the private cloud is not considered. In the case of cloud computing the provider and users of the cloud can be of SaaS and utility computing. The major focus of the work on the providers of the SaaS rather than considering the SaaS users. Where the author tried to fetch the role of clients and providers over the varied layers of the cloud computing [6].

A. Cloud Computing Style

Though people have different views on the cloud computing, they have already reached an agreement on the basic style on it. Its style is as follows [7]:

a) SAAS (Software as a service)

This kind of cloud computing transfer programs to millions of users through browser. In the user's views, this can save some cost on servers and software. In the provider's views, they only need to maintain one program, this can also save cost. Salesforce.com is so far the most famous company that provides this kind of service. SAAS is commonly used in human resource management system and ERP (Enterprise Resource Planning). Google Apps and Zoho Office are also providing this kind of service.

b) Utility Computing

Recently Amazon.com, Sun, IBM and other companies that provide storage services and virtual services are appearing. Cloud computing is creating virtual data center for IT industry to make it can provide service for the whole net through collecting memory, IO equipment, storage and computing power to a virtual resource pool.

c) Network service

Net service has a close relation with SAAS. The service providers can help programmers develop applications based on internet instead of providing single machine procedure through providing API (Application Programming Interface).

d) PAAS (Platform as a service)

Platform as a service is another form of SaaS, in this type of services the providers considers the platform for the execution of the any application. Means using the platform of the middleman any individual or organization can develop their own execution and transfer it to the users through internet and servers.

e) MSP (management service provider)

MSP is being considered as the oldest part of service facility in cloud computing. The IT industry is the major client list of this services instead of direct individual. The main usage of the MSP is the virus scanning and monitoring of the program.

f) Commercial service platform

Commercial service as platform is being defined as the integration of the SaaS and MSP, where the platform is being provided for the interaction of the users with the providers of the service. For instance, the user individual expense management system can manage user's expense according user's setting and coordinate all the services that users purchased.

B. The Characteristics of Cloud Computing

a) Ultra-large-scale

b) Virtualization

c) High reliability

d) Versatility

e) High extendibility

f) On demand service

g) Extremely inexpensive.

C. Key features of Cloud Computing

1. **On-demand self-service** - user can control computing capabilities without human interaction from the service's provider.

2. **Omnipresent network access** - promoted through the use of several different technology devices.

3. **Location independent resource pooling**- the different providers of the clouds will compute the resources on the basis of the requirement of the users.

4.   **Rapid elasticity** - capabilities available for rent can be quickly scaled up or down so that the end user can purchase any amount at any time.

5.   **Pay per use-**the storage, bandwidth and the resources to be used by the user are computed and also the pricing segment of the users for the specific service from the cloud provider on the monthly basis.

D.   Strategies Behind the Technology

The IT staff and executives are considered as the main pillars of the cloud strategy collaboration for the successful running of the business. The alone IT cannot be considered as the silo for the complete IT business. The capabilities of the IT requirement of any of the firm are to be adjusted on the basis of other competitors of the same sector

A unified cloud stratagem that enterpriseseffectiveresultstrusts on cooperationamongtechnical staff and managers. Just as technical staff cannot act as a single operative within the industry, cloud computing cannot work as a head within IT. Other cloud providers' proprietary technologies require that weregulate our IT atmosphere to their abilities. A continuingapproach demands asubstructure that is accessible and can acclimatize as our corporate and IT primacies modification. Dell's methodology to planning and development an open cloud approach emphasis on corporate and socialexpectancies.

1.   Cloud computing is not a matter of knowledge and technology, it's a stratagem. Cloud computing is fragment of acompletestratagem to fast-trackdevelopment, boost our staff and modify our business. Cloud computingdedicated to emergingresolutions that equivalent ourcorporateconcept and that push it advancing with supremetractability and small issues.

2.   Cloud computing should adapt to us, not we to it. Maximumcorporations are previously on the cloud passage, but each has specific requirements and difficulties. They work with us and our team to equivalent our approach to the appropriate cloud resolutions — without upsetting our organization.

3.   Cloud computing performs good when it assimilatesflawlessly. Our methodology is not to break and substitute, but somewhat to build use of presentreserves and make from the present level. We see cloud computing as a rationaldevelopment to what businesses are previously doing, and a method for corporations to make on technologies and procedures currently in state.

III.   TYPES OF CLOUD COMPUTING

1.   Public cloud

The easiestmethod to explain a public cloud is a substructure that is used by the unrestricted and offered by a government authority or otherorganizations [8].

2.   Private cloud

A private cloud is used completely by acorporation and the cloud contributor is any the corporation themselves or a other organization

3.   Hybrid cloud

A hybrid cloud is asubstructure that syndicates public and private clouds. It contains of a configuration of two or more clouds that all persistsspecificunits but are certainorganized by uniform or exclusivetechnology.

4.   Community cloud

A community cloud is used by a group of users from different companies that share general opinions. This specificarrangement may be organized and supported by another organization or by the company itself.

In addition, a community cloud structure may exist inconfidential or external the CSP foundations (Srinivasan, Sarukesi, Rodrigues, Manoj, &Revathy, 2012) [9]. Community cloud customerssopursue to deedparsimonies of measure while at the same time lessening the pricesrelated with private clouds or fusion clouds as well as the threatsrelated with public clouds.

IV.   CLOUD COMPUTING PLATFORM

Abicloud [10] is a cloud computing podium, It can be expended to make, assimilate and accomplishboth public and private cloud in the similarsurroundings. Through Abicloud, costumer can effortlessly and automatically organize and accomplish the server, storingorganization, system, simulated devices and features and so on. The key variance among Abicloud and further cloud computing podiums is its great net-based organizationpurpose and its central encapsulation method. Through the Abicloud, customer can varnish organizing a fresh package by just selecting a virtual machine with trackpad. This is much simpler and adaptable than other cloud computing stages that organize new assistancesover command outlines.

Eucalyptus mostly was used to make open-source private cloud stage. Eucalyptus is aflexibleprocessingconfiguration that can be expended to link the clients' functions to the valuable systems, it is an open-source infrastructure using clusters or workplaceaccomplishment of flexible, usefulness, cloud computing and a general computing standard centered on a service level protocol that licenseclientscontractset-up for operatingproficiency.

Nimbus is an open tool set and moreover a cloud computing resolutionoffering IaaS. It authorizescustomersagreementisolated resources and create the essentialfunctional atmosphereover the arrangement of simulateddevices.

Usually, all these computationalmechanisms can be categorized as three types. First one is customer sustainedsegments which are expended to maintain all types of cloud customers. Settingcustomersection, cloud customerpart,

reference client segment and EC2 usercomponent are all going to this type of module.

OpenNebula is also an open source cloud service structure. It permitscustomerorganize and accomplishsimulated devices on hardware devices and it can arrangeclient's data hubs or groups to elasticsimulatedsubstructure that can mechanicallyadjust to the difference of the operativeweight. The key variance of OpenNebula and nimbus is that nimbus deploysdistantedgegrounded on EC2 or WSRF over which customer can procedure all safety associated subjects, while OpenNebula does not.

Microsoft's Azure[11] is atransitionalfact on this field of elasticity vs. computer operatorsuitability. Azure purposes are inscribedexpending the .NET archives, and accumulated to the General Language Runtime, a source-independent succeededatmosphere. The structuremaintenances common-purpose processing, instead of a solitarycategorized method or function. Clients get a selection of language but cannot regulate the mainfunctioningprocedure or runtime. The public libraryoffers a level of impulsivesystemstructure and failover/scalability butnecessitate the designer to declaratively clarify some function properties in order to do so. Thus, Azure is midwayamongwhole application structures such as App Engine at one side, and hardware simulated devices such as EC2 at the other.

Amazon EC2 [13] is at single end of the continuum. An EC2 caseaspects much like physical machine, and customers can regulateclosely the completeapplication stack, from the kernel upwards. The API exposed is "thin": a few dozen API requests to organize the virtualized machine. There is no a priori edge on the types of system that can be presented; the minimal level of virtualization- raw CPU sequences, lock-device storing, IP-level connectivity- permitdesigners to programmingwhat they want. On the other side, this marks it integrallyproblematic for Amazon to deliver automatic scalability and failover, as the semantics related with repetition and further state organizationsubjects are extremelyfunction-dependent.

BigTable [14] expansion started in 2004 and today it is used by a numeral of Google features, like as MapReduce, which is frequentlyexpended for creating and adjusting information kept in BigTable, Reader, Book, Maps, search History, Earth, code hosting, YouTube, Gmail of Google. Google's aims for emerging its own recordcomprise scalability, and healthiercontroller of enactmentfeatures.

Map-Reduce is anoriginal software frameannounced by Google to sustenancedispersed computing on huge data sets on groups of computers. This structure is stimulated by map and reduce operationsusuallyexpended in operativecoding, though their drive in the Map-Reduce structure is not the similar as their imaginative forms. Map-Reduce archives have been inscribed in C++, C#, Erlang, Java, Python, Ruby, F#, R and other encoding languages.

Map-Reduce is a context for managinglarge datasets on definitetypes of distributable difficultiesexpending a large quantity of systems (nodes), communallymentioned to as a

group. Computational functioning can happen on data stored any in a filesystem (formless) or inside a database (organized).

V.   ARCHITECTURE OF CLOUDCOMPUTING

Cloud structurecarefullylook like the UNIX viewpoint of concerningvariousmodules which perform tasks together abovecommon interfaces. Reminiscence that the Cloud computing standardsignifies a mechanismconcerned withService of control and forwarding resources. Before we probe into reviewing the authenticdesign of Cloud computing it will be helpful to observe the probablefeatures that will be essential to understand such a structure. It is generalinformation that the structuralnecessities of the Cloud will differreliant on the function for which the Cloud is being expended. For example, social media applications such as Twitter and Facebook will have a very dissimilar set of requirements, limits and deliverables from the structure in evaluation to say,
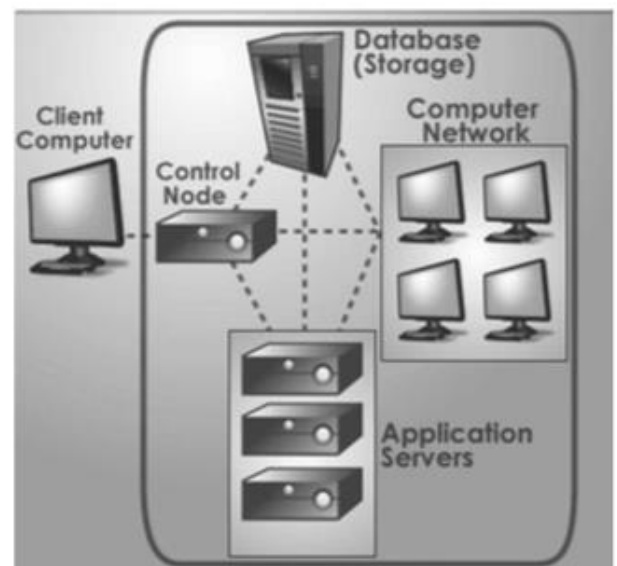

Fig 1: Basic Cloud Computing Architecture.

a remote personfitnessnursing application. Though, severalmutualstructuralfeatures can still be recognized. For example,

a.   the procedure should be accessible with the capability to comprise thousands to possibly tens of thousands of associates.

b.   It should be capable to interoperate amongdifferentfacilitynecessities and efficientlydistributereserves with their clients.

c.   The procedure should be stress-free to continue and advancement, preservingcustomerclearness during these procedures.

d.   As explainedpreviously, organizing resources such as servers and keepingmachines virtually, thusforming a virtual firm, is unconditionallycritical.

VI. ADVANTAGES OF CLOUD COMPUTING

Cloud Computing has variousbenefitsabovepprevioussystems. It has following Pros [13].

a. EasyManagement–

The upholding of the substructure, be it hardware or software is easy, therefore, fewerpains for the technical group. Correspondingly,functions that are largestoring are simpler to operating in the cloud atmosphereassociated to the similar when used by the company by its individual.

b. Cost Lessening –

The keybenefit for SMEs lies now. Cloud computing radicallydecreases the IT expenditure for SMEs. Expensiveproceduresessential not be compulsory for infrequent use of exhaustive functioning resources. Furthermore, the workforce requirement for these modules is not essential.

c. Continuous Services –

Subordinate outages are offered by cloud functioning services, thus deliveringcontinuousfacilities to the client. Though, some incidences of outages have arisen earlier, such as Gmail outage in 2009.

d. DisasterControlling–

In the matter of tragedies, an offline backup is always useful. Savingcritical informationreversed up operating cloud backupfacilities is the essential of the time for highest of the corporations. Moreover, cloud backup services not only save our statistics offline, but they also certify that they have arrangements in place for tragedyretrieval.

e. Green Computing -

Destructiveemanations cause ofwide-rangingusage of devices in corporations, microelectronicleftoverproducedover the time and energy intake is the highestdrawback of the current computing devices. This can be condensed to severalamount by expending cloud computing services. This primes to natureprotective.

VII. CONCLUSION

Cloud Computing performs a meaningfulcharacter in various fields such as e-commerce, search-engines, datamining, simulated devices, batch leaning scientific processing, digital TV and in varied area. Cloud computing has the prospective to develop an essentialsegment of our daily survives. In this paper we described the structure and commonpodiums of cloud computing. In this, we also focusedissues and challenges of cloud computing in brief. And even in presence the numerousrestrictions and limits and the requirement for enhancedapproachesprocedures, cloud computing is becoming a massivelystrikingstandard, particularly for large organizations. Cloud Computing proposals could mark the organizations within two to three years as it has the capability to meaningfully update IT.

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