ISSN No. 0976-5697

Volume 8, No. 3, March – April 2017

International Journal of Advanced Research in Computer Science

REVIEW ARTICLE

Available Online at www.ijarcs.info

Cloud Computing and its Emerging Need: Advantages and Issues

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Abstract: With the passage of time there is an elevation in the computer science field from the half century ago, experts have predicted that one day cloud computing will be used as one of the utility which will be very beneficial for all. With the growing hands in the field of virtualization, it is trusted that this approach has modified the whole IT industry. The cloud computing used as a utility is very important as other four utilities are because cloud provides computing services up to the high end services like virtual space, virtual servers, etc., which are highly essential for satisfying the needs of the user without physically purchasing all the infrastructure. To present this scenario, various computing prototypes have been proposed. After many of the milestones achieved in this field, we are now at a stage where we have almost complete computer ERA, which did not exist in reality, but is accomplishing its task and it is known to us as "Cloud computing". The author's aim for purposing this paper is to get the finer understanding about the cloud's overview and about its advantages and issues.

Keywords: cloud computing; issues of cloud; the advantages of cloud; security issues.

I. INTRODUCTION

Presently cloud computing [1] is gaining its tremendous advancement in both education and IT sector. Computing models have been vastly modified to, just like a model which consists of services that are transported in an address to services such as water, electricity, gas, and telephone. Cloud computing may be formalized as the outsourcing of the computer services just similar to gas supply is outsourced. The customer simply uses it and need not to concern about from where since it is coming or how it is made or transported to us. Just every month he has to pay the bill for what he had used. The main purpose of cloud computing is same, user can directly make use of storage or any power or any environment without bothering from where is it coming or how he is getting and at the closure user simply have to reimburse for what he has used. In analogous model, users appeal for the needed services and approach those services without a glance to, from where these services are being bestowed or how they are conveyed to us. Several computing prototypes have been tracked for gaining the computing aspects and some of them are cluster computing, Grid computing, and many more cloud computing.

"Cloud computing may be defined as the way in which we can store data or information permanently on servers and temporarily cache them on the client side through laptops, computers, sensor, etc." Figure 1 shows that the cloud computing act as a utility where users are able to access services from anywhere in the world. Cloud computing is briskly turning the tables towards flourishing the software for millions of customers to deplete it like a service, instead of run on their individual computers

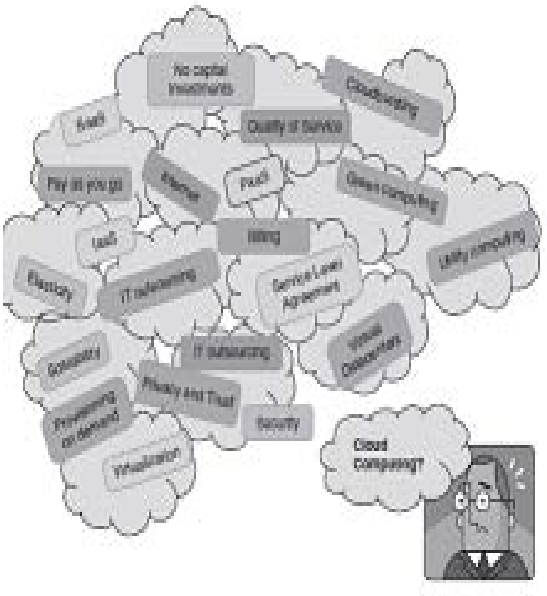

Figure 1. Cloud computing [4]

II. HISTORY OF CLOUD COMPUTING

The major idea of bringing computing resources across the world was grounded in the sixties. The "intergalactic computer network" idea was given by J.C.R. Licklider in sixties, who was carrying the loads for building up the advancement of ARPANET in 1969.

Table I. History of Cloud

Year	Technology	Work
1950	Mainframe computers came into existence	Several users access chief computer via dummy terminals. The task of dummy was to enable user access the mainframe computer.
1960	Time sharing systems were made.	Was used by many traders such as IBM.
1970	Full time sharing systems was made.	Platform as multics, earliest UNIX ports.
1990	Telecommunications companies use it.	Which founded approach for delivering enterprise application via a simple website.
2006	Amazon introduced elastic cloud computing.	
2010	Open stack	Rackspace and NASA matually projected it as an open source cloud software.
2012	Oracle cloud	Oracle announced its own cloud.

Work these days is done on FOZ COMPUTING [3]. It is the accretion that takes place of cloud computing. It provides us with much more features than cloud computing is providing to us these days.

It is a prototype that has enhanced the Cloud computing services to the crust of the network. Homogenous to Cloud, Fog bestows with data, storage, and application services to end-users. Fog computing is still in its developing phase.

III. DEFINITIONS FOR CLOUD

- Cloud Computing is a kind of dummy model for freely accessible, on appeal network approach to a pool of collections of resources like Networks, services, storage and applications that can be analyzed by a third party with least possible authority efforts from the user's side.
- Cloud Computing [2] was a fuzzy term for a very fuzzy and a solitary future in which computing will happen in at some remote location without the help of human management. Computing resources would be available at a low cost. Users have, not to care about how the computers, their software, or the network operates.
- Cloud computing [4] is a technical upgrading that mainly works in designing computing systems, developing applications, and power real services for building software. The functioning of cloud computing is done by dynamic provisioning, which does not only apply to services, but also to manage capability, storage, networking, and infrastructure. Resources are available using the Internet and follow up the feature of pay as you go to users who are using the services.
- Of all, most messy way of definition of the cloud can be stated as "I am not bothered about where my servers are, who look after them, where my documents are treasured, where my applications are accommodated. I just want my resources to be always achievable and approachable from any device connected through Internet. And I am willful to pay for the service that I have a need for."

IV. REVIEW OF CLOUD COMPUTING

A. Factors

B. *1) Scalability*: Cluster of resources are needed to be used by a large fraction of flocks having discrete demand is increasing day by day. Thus, in cloud computing scalability is its major factor for expansion.

C. *2) Heterogeneity*: With the number of devices working together, the wide range of different types of resources is currently increasing.

D. *3) Economics*: It assists the protocol that is "pay as you go" the user will only pay for the services that he had brought into play. If the user had exercised the services for just one day or for one hour he had to meet only for that interval of time.

E. *4) Mobility*: As we are in the state of modern, globalized economy and with modern smart phones and powerful mobile devices, where each user want to access their things on their smart phones. Growing demand for online availability for data, mobile office like working environments etc. is notable. This is one of the main factors in the evolution.

B. Types

Following are the types [6, 7] of cloud providers.

1) *IaaS:* Stands for Infrastructure as a Service. It offers virtualized resources like computation, storage, and communication. A cloud infrastructure provides provisioning of on demand servers which are running on different operating systems and softwares. Infrastructure services are considered as the basics of computing model. Flexiscale, GoGrid and Amazon EC2 mainly offer IaaS services [21].

2) *PaaS:* Stands for Platform as a Service. These provide a higher level of illustration to make a cloud comfortably programmable. The PaaS provides an ambiance in which dealers create, extend their applications and do not feel the urge to know how many processors or what a heap of memory is used [20]. Force.com, Microsoft Windows Azure and Google App Engine are some example of Platform as a Service.

3) *SaaS:* Stands for Software as a Service. Applications reside on the prime of the cloud stack. Services which are equipped for users by this layer can be attained by flocks through Web portals [7]. So these days large numbers of consumers are migrating from manually installing computer programs to on-line software services which provide same functionally. Desktop applications like spreadsheet and word processing can now available on the web in the form of services. SaaS provides the capturing of applications and makes the customer experience less because of dilemma in software maintenance and simplifies development and testing for

providers. Salesforce.com, Rackspace are example of SaaS.

4) *STaaS:* Stands for storage as a service. It is a buying and a selling layout in which service master of the house provides space in the form of lease to the user from their storage infrastructure. This gives a green light signal to users for receiving the storage in much less cost effective way than other corporations or individuals can give their storage. STaaS is mostly used to clear up off-site backup objections.

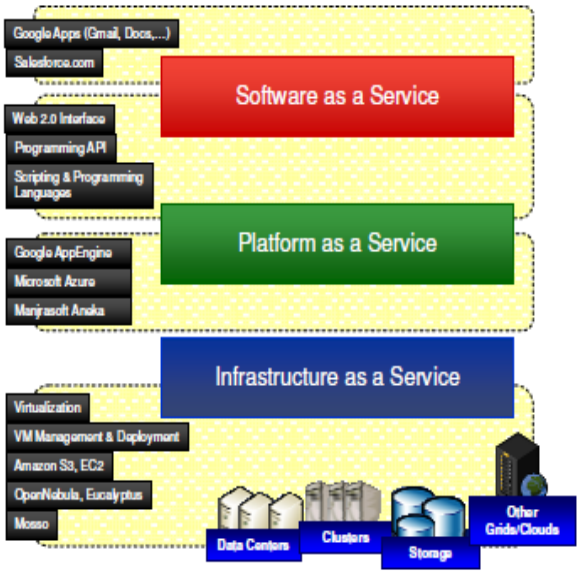

Figure 2. Cloud computing services [11]

5) *SECaaS:* Stands for security as a service. It is a field in which service provider blends their security services into an infrastructure on the basis of cost effective way than most corporations or individuals can bestow on their own. These security providers provide users with security event management, intrusion detection, anti-virus and authentication.

6) *DaaS:* Stands for Data as a service. DaaS is a member of software as a service. The DaaS is dependent on the approach of providing data as a service to the user. Dealers can easily approach to the data directly over the internet.

7) *TEaaS:* Stands for Test Environment as a service or on-demand test environment is a testing and delivery model in which software and it's their data are groomed in the cloud centrally and are attained to users for their testing purposes.

8) *BaaS:* Stands for Backend as a service or mobile as a backend service. It's a layout for blending cloud storage with mobile app developers and provides other aspects like integration, push notifications, and user management with social networking services. These services are equipped with customer via application programming interfaces (APIs) and custom development kits. In cloud computing BaaS is a fresh development, mostly BaaS starts from 2011 onwards.

Table II. Cloud Providers

Types	Service content
IaaS	Load balancing, data storage, Computer servers.
PaaS	Programming languages (like Java, PHP, Python) frameworks.
SaaS	Web pages, office suites.
STaaS	Giving storage for large amount of data.
SECaaS	Security purpose.
DaaS	Data provided for the user.
TEaaS	The test case environment is made for testing to be done by the customer on their ends.
BaaS	Termed as mobile as a service, provides services for storing and running the application of our mobile on a cloud.

C. *Deployment models*

In cloud computing there are following deployment models [8, 20].

1) 1) *Private cloud [21]:* This cloud authority is cultivated for the use of only single organization which is being composed of multiple consumers e.g. business units. It may be governed, managed by the single organization for their own use.

2) 2) *Community cloud [20]:* This cloud authority is maintained for defining communities of consumers from organizations that have to experience the same data within each other. It is organized by single or more of the organizations in the community.

3) 3) *Public cloud [21]:* This cloud authority is maintained for generic public. It may be managed or owned by academic, business or statecraft organization or some blending of them. It is maintained and managed by 3rd parties (cloud provider) itself.

4) 4) *Hybrid cloud [8]:* This cloud authority is aggregation of more than two cloud authorities (private, public or community) which is solitary entities, but combined with technology that approves both data and application mobility like cloud bursting for load balancing between clouds.

Table III. Deployment Models

Model	Cost issues	Security issues	Control issues
Public	Setup: highest	Least secure	Least control
Private	Setup: high	Most secure	Most control
Community	Setup: relatively low	Less secure	Less control
Hybrid	Moderate	Moderate	Moderate

D. *Literature review of cloud computing*

Griffith et al. in [35] discussed it as an image of a pool of resources which is available to the user on demand and the attitude of paying only for the use of resources on a short-term basis as required by the user.

Vouk in [36] stated Cloud computing embraces as cyber-infrastructure which builds on software services, networking,

utility computing, grid computing, distributed computing, Web and virtualization.

Vaquero et al. in [37] defines cloud as a pool of freely accessible and usable resources that can be virtual also like development platforms, hardware. For variable loads resources are dynamically reconfigured or scale, allowing for proper resource utilization. In the end user have to pay for what he had used whose assurance is maintained by the infrastructure provider with the help of SLAs.

Mell et al.in [38] state's cloud as a model for facilitating on-demand, easy access to a network from a collective bank of resources, e.g., storage, networks, applications, services and servers that can be given and maintained with minimum stress or with less interaction of the service provider.

E. Working of Cloud computing

Let's explain its working with an example [7]. Let's imagine we are heading a large company or organization. Our prior responsibility is to ensure that all the employees in the company have the proper software and hardware for their work. But only buying computer for each employee is not sufficient they will also require a software license where they get the tools for execution of their work. Moreover, there is new hiring's that time also we require computers and software license so that each employee can work. With respect to cost it is very stressful. We will only load one application instead of installing software to each computer. The application would allow employees to login into a web based server, which consist of all the programs they needed for their work. It is the concept on which cloud computing works and it have shuffled the entire IT industry.

Due to the unfolding of this concept, local computers have, not to run heavy applications on their systems. The cloud providers handle them by their own. The only thing what user needs is to connect him from the internet connection to run cloud computing systems which is simply as any web browser works.

Best examples of it are an e-mail account with a Web-based e-mail service like Hotmail, Yahoo! Mail or Gmail. You have not to run your email program on your computer, you simply log in to a Web e-mail account through internet. The software and storage for our account doesn't occur on our computer, it's on the server side. This is the working of cloud computing.

F. Advantages

1) *Cost efficiency*: Cloud computing [9] provides us with ultimate cost efficient approaches to adopt, boost and maintain. Previously, companies make lot in finance and put on license fee for their software and all which was very expensive. Additionally, cloud is achievable at moderate rates and lowers the company's IT consumption. Nearby, there are numerous extended scalable opportunities that cloud provides for us that are pay-as-you-go and much else which construct cloud as a very reasonable to cost.
2) *Almost Unlimited Storage*: Heaps of data are stored on a cloud which gives us approximately the boundless storage space.
3) *Backup and Recovery*: Subsequently, all the data is which is gathered in the cloud is backed up and restoring it is much uncomplicated than storing the data on a physical device. Abundant working is done by several cloud service providers to grab recovery of information. This makes the absolute mechanism of recovery and backup much effortless than the other traditional approach of data storage.
4) *Automatic Software Integration*: Software integration in cloud is frequently something that manifest significantly. This closely relates that cloud users ought not to take the additional trouble to integrate their applications as per own choices.
5) *Easy Access to Information*: The time users roll itself into the cloud, they can approach the information from everywhere by using internet.
6) *Quick Deployment*: Cloud computing allows the assistance of quick deployment. Once we opt for this approach of functioning, the full system can be fully functional in few minutes.
7) *Easier to scale of services*: It makes pleasant for companies to scale their services corresponding to the appeal of clients.

G. Issues

In spite of the innumerable asset as discussed over, Cloud computing also has countless issues. Businesses, exclusively smaller ones, need to be attentive for such perspectives before going in for this technology. The main flyers involved in it are:

1) *Technical Issues*: It is legitimate that information and data conserved on the Cloud can be achieved any time and from everywhere, but there are occasions when the system can have few unhumorous affairs. The end user should be conscious that this technology is always prone to drain of their data and some other technical issues. Even the best providers of cloud have to undergo this kind of distress.
2) *Security*: Another dominant argument on a cloud is illustrated as security [24]. Before using this technology, the user ought to know that they will hand over all their company's sensitive information to a third-party i.e to the providers of cloud. This could enforce a great danger to the company. Hence, businesses ought to be sure that they are appointing the faithful service providers, who will retain their information securely.
3) *Prone to attack*: In the cloud, accumulation of our data and information causes companies exposed to intrusion and threats. So there are maximum chances of robbering of our sensitive data.
4) *Cost*: In the beginning utilization of cloud computing may resemble much more moderate than a distinct software solution installed. The companies have to certify's that the cloud operations have all the attributes that are needed by software and if not, it has to analyze which of them are missing features essential to them.
5) *Inflexibility*: Making a choice about which cloud dealer frequently means locking the business into using their applications or formats. For instance, possibility to insert a document created in another format into a Google Docs spreadsheet is not possible. The company must be adequate in adding and/or subtracting cloud users as significantly as its business amplify or compact.
6) *Load balancing*: In cloud computing [10] another main issue these days is load balancing. It is an execution that allots the workload constantly to all the nodes in the cloud to divert a stage like some nodes are densely loaded with work and others are jobless or doing little work. It helps achieving high resource utilization ratio and user satisfaction, therefore improving the overall performance and resource utilization of the system.

V. SECURITY

According to Wikipedia [23] Security in cloud computing may be defined as "Security in the cloud may be termed as "cloud security" is an evolving domain of computer security, network security and information security. Security may introduce a wide set of policies and technologies provided to protect our applications, data and infrastructure of cloud computing."

According to figure 3, Main concern these days in cloud computing is security [14]. Securing data have become the priority for all the cloud vendors. To enter on the virtual environment a user is required to transfer his data throughout the cloud. Consequently, several security concerns arise [15, 16, 17, 18].

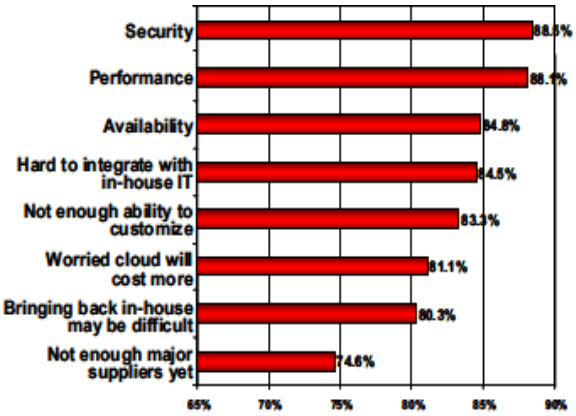

Figure 3. Adoption challenge [25]

A. *Information Security*

It contributes in security, regarding its availability, integrity and confidentiality of data [19].

1) *Loss of data*: Outsourcing our data means losing control over data. Large banks don't work on cloud because on delivering their data to the cloud and get managed by the third party is much concern to the bank [20, 26]. The Amazon Service Storage (S3) APIs arranges both bucket and object level access controls, with default settings that only certified user have the access to the bucket or object. The first most cases after user approaching to the data is to be authenticated itself using the HMAC-SHA1 signature with the help of user's private key [19, 27, 18]. Only after that user can have full authority over who is accessing their data [28].
2) *Data Integrity*: It means that data can be only changed by the authorized users, e.g. user is responsible for making and validating queries and the server executes them trustfully, the intruder will always try to modify the client-side code to make changes so it means the intruder can read, change, or delete data easily [20]. Standards for data integrity do not exist till now [17].
3) *Risk of Seizure*: While using public cloud we are distributing our resources with distinct companies and disclosing our data in a domain where other companies are also sharing their data, thus could give the government an account to grasps the assets because it breaches another company's law. So it measures that sharing within the cloud, can insert data at risk of seizure [15, 17]. Approach to protecting our data across the risk of seizure is to encrypt our data [15, 18].
4) *Incompatibility Issue*: The single cloud provider provides many services which can be incompatible with another cloud provider. It's the decision of user to whom he should move. For example compatibility of Amazon's "Simple Storage Service" [S3] is not done with IBM's Blue Cloud, or Google, or Dell [15, 16, 28].
5) *Constant Feature Additions*: Cloud applications endure countless feature additions [9, 13], and their job is to keep users up to date with new applications and also preserving them. AWS communicates with their users via email whenever servers are going to be updated [19].
6) *Cloud Provider Goes Down*: This scenario has various purposes through which it may be conducted. Many times cloud providers provide the services which are given to the one user in excess which spoils the connection of another user. So in that case user should have the option to choose to second cloud provider and use backups of his data [15].

B. *Network Security*

Network security measures are used in the protection of our sensitive data during their transmission, between end user and the computer and between computers and computer [34, 35].

1) *DDOS*: In DDOS (Distributed Denial of Service) attack servers and networks to bring them down by passing huge amount of network traffic and users are denied from accessing certain Internet based Service.
2) *Man in the Middle Attack*: This attack is similar to eavesdropping in that the attacker arrange in making the connection with the consumer and carry messages between them, making user consider that they are communicating exactly with one another over a private connection but the truth is whole conversation is guarded by the attacker [34].
3) *IP Spoofing*: It is an establishment of TCP/IP packets exercising IP address of somebody else's. Interrupter gains unauthorized entrance to a computer, from where he accelerates the messages to a computer with an IP address symbolizing that the message is approaching from faithful host [34, 35].

C. *Security issues*

More complicated issues regarding security are present in a virtualized domain because we have to conduct security on two tiers i.e. physical host security and virtual machine security. If there is risk for physical host servers, all residing virtual machines on that physical server are affected. And if negotiation is done on the virtual machine, it might also cause a serious effect on the physical servers, which in return may have a bad effect on all virtual machines running on that host [29].

1) *Instance Isolation*: Isolation certify's that distinct instances are functioning on the related physical machine are detached from each other i.e each machine is independent. Each machine gets information through packets, every packet must pass through the layer, thus each machine working with neighbors has no access to that information and can be treated as if each machine is working on separate physical hosts [19].
2) *Host Operating System*: These hosts are systems that are constructed and configured to assure the management aim of the cloud. Types of access given to the users are audited and logged. When a user is no longer a part of business needs, the privileges and access to those hosts or user and relevant systems are revoked [30].
3) *Guest Operating System*: Virtual occurrences are altogether disciplined by the user. The user has full hold over services and applications. AWS has no rights to users occurrence and cannot account in the guest OS [19, 28, 27].

D. *General security issues*

In addition to the above mentioned issues there are some other general security issues.

1) *Data Location*: When the user uses the cloud, he doesn't know exactly where the data is hosted, in which country it is stored [31, 32, 33]. Amazon also does not tell the user where they are having their data centers. So it is very difficult to get where our data has been located [15].
2) *Data Sanitization*: Sanitization is an approach of abolishing acute information from a physical device. While adopting cloud computing users are ever inspected about, what becomes

to data reserved in a cloud after it has been send assigned to cloud [30]. Storage devices when attain its useful life, AWS agenda includes a decommissioning action that confirms that user's data are not disclosed to unauthorized particulars. The technique DOD 5220.22-M is used by AWS to destroy data [19, 28]. Once destroyed it cannot be retrieved back.

3) *Job Starvation*: It is when one job proceeds for ample volume of resource for accomplishing the job which causes resource starvation for the other jobs which are queued for completion of their work. User can also set the priority for the affected tasks/job [18, 30].

VI. RELATED WORK [24]

A. Current security model

In cloud computing, achieving security is in progress, several technologies have been shaped to frame the security structure. Security given by the cloud must be experienced by user as security services. Confidential messages can be carried, recognized, and operate by standard Web services tools. This working environment is a good choice. The security in the cloud has many merits, but there are some disadvantages also e.g. absence of the mechanism of the hardware to assist the trusted computing in it, trusted crux in an environment of cloud has not been transparently characterized, formulated and protected by certificates and are not secure in computing environments. There is a lack of many mechanisms for registering and classifying the participants carefully, such as the tracing and monitoring for participants.

B. The challenge for the security

Frequent users associate in working with cloud and they blend or retire cloud on their needs. The main concern in it is that Users, resources, and the cloud ought to preserve the trustful relationship among them. The cloud consists of distributed users and resource from distributed local systems, which have different security policies. On the grounds of that how making a clear-cut association among them is a challenge for us. The security concern in cloud computing habitat has a few conditions, including confidentiality, integrity, security and trust among the entities, building trust domains.

C. Literature review for security in cloud computing

Arijit Ukil et al, [19]: In this paper, security problems which is faced by cloud computing has been evaluated. This paper provides us with required support techniques and security architecture for making the infrastructure of cloud computing secure.

Rabi Prasad Padhy et al, [27]: Issues related to security are discussed in this paper, as users are finding complexities in the cloud, it's become difficult for cloud to get peer-to-peer security. Many new techniques for security should be developed and existing security techniques should be improved or changed.

Kashif Munir et al, [28]: In this, different issues regarding security are discussed. The Proposed model for security is also given to make an environment of cloud computing more secure.

Fernades et al. [29] describes the related work for issues in the cloud. Work related to their main topics like threats, vulnerabilities and attacks. The paper has also proposed a taxonomy for their classification.

VII. CONCLUSION

Demands for cloud computing is a rapidly evolving. If properly used and integrated it can be very beneficial for businesses and academics. More and more companies offer PaaS, SaaS, IaaS and many more to create business values and to attract more and customers. In the paper, working on cloud computing has been discussed by the author with a very small example of our day to day life i.e working of g-mail and have focused on the various advantages of the cloud computing. Today Technology has reached to such an extent that if we look back we can't even imagine our today's world with that speed or technology. It is spoken that everything has two sides. So, despite the advantages of its cloud computing we have seen, there are also issues which are quite serious and risky to deal with. In cloud security is the dominant affair these days. The Future scope of my paper would be working on the security issues and will work on how to search in encrypted data because these days huge amounts of data is encrypted for security purposes. So finding the data without decrypting it is the main task to do.

VIII. REFERENCES

[1] R. Buyya, C.S. Yeo, S. Venugopal, J. Broberg, and I. Brandic, "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility," Future Generation computer systems, vol. 25, pp. 599-616, june 2009.

[2] S. Zhang, X. Chen, S. hang and X. Huo, "The comparison between cloud computing and grid computing," In Computer Application and System Modeling (ICCASM), 2010 International Conference on, vol. 11, pp. V11-72, october 2010.

[3] T. Ashwini, and M.A. SG, "Fog Computing to protect real and sensitivity information in Cloud,"

[4] A. Jain, and R. Kumar, "A Taxnomy of cloud computing," International journal of scientific and research publications, Vol. 4, pp. 125, July 2014

[5] M. Mishra, I. Arora, P. Singh, and S. Prabhakar,"An Assessment of cloud computing: Evolution," IJRET, pp. 2319-1163.

[6] R. Buyya, J. Broberg, and AM. Goscinski, eds. Cloud computing: Principles and paradigms, John Wiley & Sons, Vol. 87, December 2010.

[7] P. Sareen, "Cloud computing: types, architecture, applications, concerns, virtualization and role of it governance in cloud," International Journal of Advanced Research in Computer Science and Software Engineering vol. 3, March 2013.

[8] F. Liu, J. Tong, J. Mao, R. Bohn., J. Messina,L. Badger, and D. Leaf, "NIST cloud computing reference architecture," NIST special publication, vol. 500, pp. 292, September 2011.

[9] A. Apostu,F. Puican, G.E.A.N.I.N.A. Ularu, G. Suciu, and G. Todoran, "Study on advantages and disadvantages of Cloud Computing–the advantages of Telemetry Applications in the Cloud," Recent Advances in Applied Computer Science and Digital Services. New York: Wseas, vol. 200, pp. 118-123, 2013.

[10] A. Khiyaita,H. El Bakkali, M. Zbakh, and D. El Kettani, "Load balancing cloud computing: State of art," In Network Security and Systems (JNS2), IEEE, National Days of, pp. 106-109, April 2012.

[11] C. Vecchiola, S. Pandey, and R. Buyya, "High-performance cloud computing: A view of scientific applications," In Pervasive Systems, Algorithms, and Networks (ISPAN), IEEE 10th International Symposium on, pp. 4-16, December 2009.

[12] H. Tianfield,"Cloud computing architectures," In Systems, Man, and Cybernetics (SMC), IEEE International Conference, IEEE Press, October 2011, pp. 1394-1399,.

[13] T. Point,"Simply easy learning," Internet: http://www. tutorialspoint. com/uml, January 2013.

[14] S.K. Muttoo,R. Gupta, andS.K. Pal, "Analysing Security Checkpoints for an Integrated Utility-Based Information System," Springer Singapore, In Emerging Research in Computing, Information, Communication and Applications, pp. 569-587, 2016.

[15] G Reese, Cloud application architectures: building applications and infrastructure in the cloud," O'Reilly Media, Inc.", April 2009.

[16] J. Harauz, L.M. Kaufman, and B. Potter, "Data security in the world of cloud computing," published by the IEEE computer and reliability societies", July 2009.

[17] J.W. Rittinghouse, and J.F. Ransome, Cloud computing: implementation, management, and security, CRC press, April 2016.

[18] J. Brodkin, "Gartner: Seven cloud-computing security risks," Infoworld, pp. 1-3, July 2008.

[19] A. Ukil, D. Jana, and A. De Sarkar, "A security framework in cloud computing infrastructure," International Journal of Network Security & Its Applications, Vo.l 5, September 2013.

[20] T. Dillon,C. Wu, and E. Chang, "Cloud computing: issues and challenges," In Advanced Information Networking and Applications (AINA), 24th IEEE International Conference on, pp. 27-33, April 2010.

[21] L Ertaul, S. Singhal, and G. Saldamli,"Security Challenges in Cloud Computing," In Security and Management, pp. 36-42, July 2010.

[22] Y. Gao, H. Guan, Z. Qi, Y. Hou, and L. Liu,"A multi-objective ant colony system algorithm for virtual machine placement in cloud computing," Journal of Computer and System Sciences, Vol. 79, December 2013, pp. 1230-124.

[23] B. Furht, "Cloud computing fundamentals," In Handbook of cloud computing, Springer US, pp. 3-19, 2010.

[24] Z. Shen, and Q. Tong, "The security of cloud computing system enabled by trusted computing technology," In Signal Processing Systems (ICSPS), IEEE2nd International Conference on, vol. 2, pp. V2-11, July 2010.

[25] A. Jain, and R. Kumar, "Confidentiality Enhanced Security Model for Cloud Environment," ACM, In Proceedings of the Second International Conference on Information and Communication Technology for Competitive Strategies, pp. 139, March 2016.

[26] M. Descher, P. Masser, T. Feilhauer, A.M. Tjoa, and D. Huemer, "Retaining data control to the client in infrastructure clouds," In Availability, Reliability and Security ,IEEE, International Conference on, pp. 9-16, March 2009.

[27] R.P. Padhy, M.R. Patra, and S.C. Satapathy, "Cloud computing: security issues and research challenges," International Journal of Computer Science and Information Technology & Security (IJCSITS),Vol. 1, pp. 136-146, December 2011.

[28] K. Munir, and S. Palaniappan, "Framework for secure cloud computing," Advanced International Journal on Cloud Computing: Services and Architecture (IJCCSA), Vol. 3, April 2013.

[29] T. Takahashi, G. Blanc, Y. Kadobayashi, D. Fall, H. Hazeyama, and S.L. Matsuo, "Enabling secure multitenancy in cloud computing: Challenges and approaches," IEEEE, In Future internet communications, 2nd baltic congress on, pp. 72-79, April 2012.

[30] S. Hanna, "Cloud computing: Finding the silver lining. Distinguished Lecture in Inst. For Security," Technology, and Society, 2009.

[31] P. Fingar, Dot cloud: the 21st century business platform built on cloud computing. Meghan-Kiffer Press,Febaray 2009.

[32] R. Buyya, C.S. Yeo, and S. Venugopal, "Market-oriented cloud computing: Vision, hype, and reality for delivering it services as computing utilities," In High Performance Computing and Communications, 10th IEEE International Conference on, pp. 5-13, September 2008.

[33] L Ertaul, S. Singhal, and G. Saldamli,"Security Challenges in Cloud Computing," In Security and Management, pp. 36-42, July 2010.

[34] L.J. Zhang, and Q. Zhou, "CCOA: Cloud computing open architecture," In Web Services, IEEE International Conference on, pp. 607-616, July 2009.

[35] M. Armbrust, A. Fox, R. Griffith, A.D. Joseph, R. Katz, A. Konwinski, G. Lee, D. Patterson, A. Rabkin, I. Stoica, and M. Zaharia, "A view of cloud computing," Communications of the ACM, Vol. 53, pp. 50-58, April 2010.

[36] M. A Vouk, "Cloud computing–issues, research and implementations," CIT. Journal of Computing and Information Technology, Vol. 16, pp. 235-246, December 2008.

[37] L.M. Vaquero, L. Rodero-Merino, J. Caceres, and M. Lindner, "A break in the clouds: towards a cloud definition," ACM SIGCOMM Computer Communication Review 39, pp. 50-55, December 2008.

[38] P. Mell, and T. Grance, "The NIST definition of cloud computing," 2011.