

RESEARCH PAPER

SERVICE LEVEL AGREEMENT GOVERNANCE FOR CLOUD COMPUTING

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Abstract: Service Oriented architecture is a methodology which gives the brief idea about the services that how the services can help to the organization which are independent with each other. One organization can take advantage of these services without developing same services which is already available in other organization after a small agreement between two parties. It saves much time and money as well as application will also be ready soon and users can use it. Service Oriented Architecture has changed the minds' of IT experts and now they believe to use the services of another party instead of developing same services in their organization which are already available and can be used any service depends on the company requirements. These agreements are documented and it is necessary that both parties should be ready to fulfill all the conditions which are mentioned in the white paper. This agreement is about the service so it is called "Service Level Agreement" One company which is providing the service is called Service Provider (SP) and which is receiving the service is called Service Receiver (SR). Cloud Computing is the latest technology which is more popular in the field of IT and It is the first choice of Information Technology department which has huge demand of the many organizations. It is form of the internet and the best thing of the cloud is that each data will be on cloud and can be accessed from anywhere. Many companies are providing cloud service to users which are cheap in comparison to external disk storage and also more secure. Some big companies are providing these services to small organizations which need cloud services. For example, Microsoft, Google, Amazon, IBM etc. Cloud service provider (csp) which will provide all the services related to cloud like, security, accessibility and what should be the minimum bandwidth to access the files from the cloud all the information and this agreement may be long year or few year depends on contract between two parties.

1. Introduction

Service level agreement for cloud is the legal agreement between two parties' first one which will provide cloud service (service provider) and another one which will receive the cloud service (service receiver). Now a days, this service is more popular and many companies are creating some space in the cloud for the big data. "Big data" means huge amount of data and it can be any form and can come may sources. For example, computer, laptop, phone or any device which can access internet. Cloud is defined as both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services (Pankesh Patel, 2009). Cloud Computing is the combination of many computing concepts and technologies. For example, Service Oriented Architecture (SOA), Web 2.0, virtualization and other technologies with reliance on the internet (Keiko Hashizume, 2013). The service level agreement can be present anywhere between the two or more parties on the basis of their term and conditions. The best example of SOA is the android application which is developed by Google but later it provides service to the OHA (Open Handset Alliance) which is a consortium of 84 companies (java T point, 2015). Now days, Market scenario is totally depends on the cloud business and IT experts know very well about future scope so they investing much money on cloud.

2. Literature Review

2.1. Cloud Computing and Big Data

The huge amount of data which are coming from many sources and these data may be structure or unstructured which are difficult to solve with simple method or put into the database so developers need to arrange the data in a sequence order and send same data when users want to access. These are some techniques which process the big data hadoop, map reduce and handoop distribute file system (HDFS). Users have first choice cloud computing because they want to store all the data in the cloud and can retrieve easily instead of store the data in a device disk. The cloud computing uses networks of a large group of server with connection instead of installing any application in the system (Venkata Narasimha Inukollu, 2014).



Figure.1.1 – Cloud computing in distributed environment

2.2. Cloud Computing Building Blocks

Cloud computing is the combination of many different service and these services are called building blocks of cloud computing. These services may be for the system from the cloud or cloud to the system. Generally cloud services are divided in to three different categories: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

2.2.1. Software-as-a-Service (SaaS)

SaaS service provides a way in which Application Service Provider (ASP) gives different software applications over the internet and it also gives the chance to the users to install and operate on the system. SaaS vendor takes all the responsibilities for deploying and managing the IT infrastructure (servers, operating system software, databases, data center space, network access, power and cooling, etc.) and processes (infrastructure patches/upgrades, application patches/upgrades, backups, etc.) required to run and manage the full solution. SaaS gives a complete set of application offered as a service on demand (Rabi Prasad Padhy, 2011). The best example is Google apps in which many applications included and it is provided by Google and every product has their own condition to installing or operating on the system and there is no relation between two services.

2.2.2 Platform as a Service (PaaS)

It is the best platform for the developers where they can develop or host applications without downloading or installing software and IT manager or end users also can take these advantages. It provides an infrastructure with a high level of integration in order to implement and test cloud applications. The users cannot manage the infrastructure (including network, servers, operating systems and storage), but they have some permission to control deployed application and possibly their configurations (Rabi Prasad Padhy, 2011). For example, Google App Engine which gives a big infrastructure for building and run applications. This app Engine applications are easy to build, maintain, and also can change when needed. The best thing of the Google app Engine is that there is no server to maintain so when developers upload the application and it is ready to deploy (Google Cloud Platform, 2015).

2.2.3. Infrastructure as a Service (IaaS)

Infrastructure as a Service (IaaS) refers to the only about hardware which can provide service using Virtualization technology and this service is only concerned about to make resources such as servers, network and storage also more easily accessible by applications and operating system (Rabi Prasad Padhy, 2011). For example, the most popular virtualization technology is VMware which provides operations on the demand of the developers and they use Application Programming Interface (API) for interactions with hosts, switches, and routers, and gives the chance to adding new equipment's (Rabi Prasad Padhy, 2011).

2.3. Features of Cloud Computing

There are many benefits of the cloud computing which have changed the users' mind and attract towards the cloud. The most beneficial part of the cloud computing is that it easily integrate with SaaS resources applications into an organization internal applications. The remote network may have become part of the local network (MITCHELL COCHRAN, 2011).

- A) Broad Network Access:** There is no need that users should have laptop, computer to access the cloud computing they can access the data with small device which have the internet service.
- B) Scalability of Infrastructure:** Every day many users make an account in the cloud and some delete the account and it does not create any problem and easily managed by service provider and users can be scaled according to needs.
- C) Flexible/Elasticity:** Cloud computing is very flexible for the users who do not know more internet they can easily access cloud computing instead of knowing infrastructure, technical or human interaction.
- D) Unlimited Storage space:** The most beneficial part of the cloud which always users consider, unlimited storage space where they can store the maximum data structured or unstructured.
- E) Easy Access information:** There is no need that where are the users if they have internet service they can easily access the information quickly because cloud is independent any location.
- F) Economy and Cost Effectiveness:** There is no need physical infrastructure or software to access the cloud so it saves much money a small device can access millions of instructions.

3. Research Design and Methodology

I. Cloud Computing Deployment

Cloud computing can be deployed in four ways depending on the customers' requirements. This division is only point of security because some data are very important so organizations do not want share with every one so they want to give some id to access the cloud computing to specific users. This is the solution of cloud computing and also easiest method to separate cloud computing and apply service level agreement on the basis of the division.

a. Public Cloud (External Cloud)

Public cloud computing is very popular among the users because it provide some free space in the cloud for the user after a small registration and they can keep the data into the cloud but data should be limited . This cloud is managed by third party and data are centralized and less secure because millions of users access this cloud computing at one time (Rohit Bhadauria, 2013). For example, Gmail, Yahoo, Microsoft etc. provide some free space to the users which can easily accessed. Google Drive is now more popular because it is providing more space which is sufficient for a student.

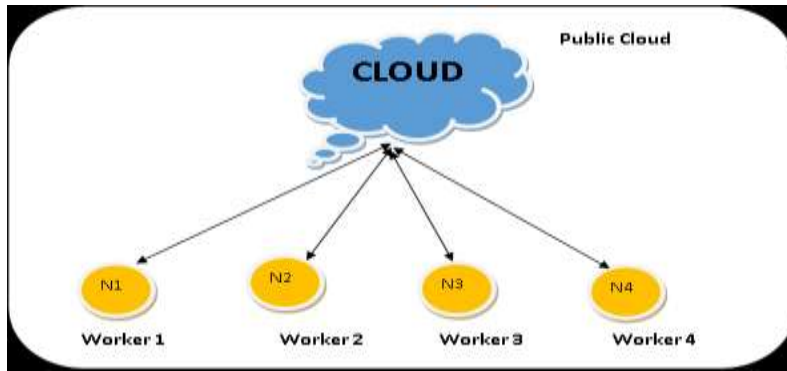


Fig a. Public Cloud (Millions of users)

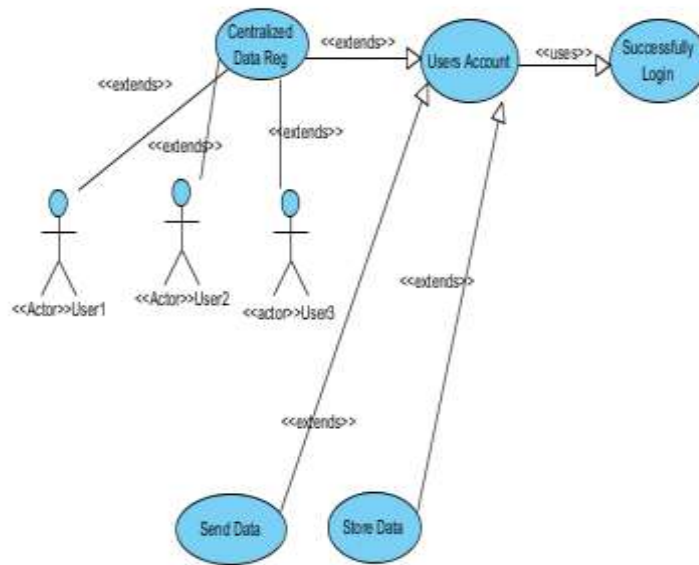


Fig a.1. Use case diagram cloud computing of public cloud

- The disadvantages of this cloud are that data are centralized and many of hacker try to hack the data sometimes they get success.

b. Private Cloud

Private cloud computing is secure because it belongs to specific customers or organizations and only those users can access data from the cloud who have appropriate permission. This is managed by either by the organization itself or third party service which is providing the cloud services (Rohit Bhadauria, 2013). This cloud can be accessed by few thousands of users which is very less in comparison to the public cloud.

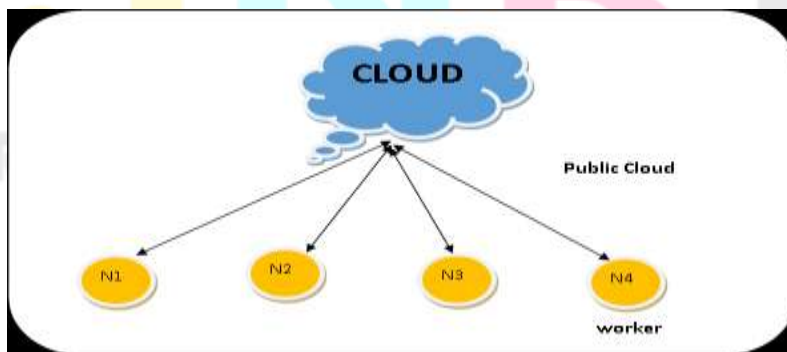


Fig b. Private Cloud

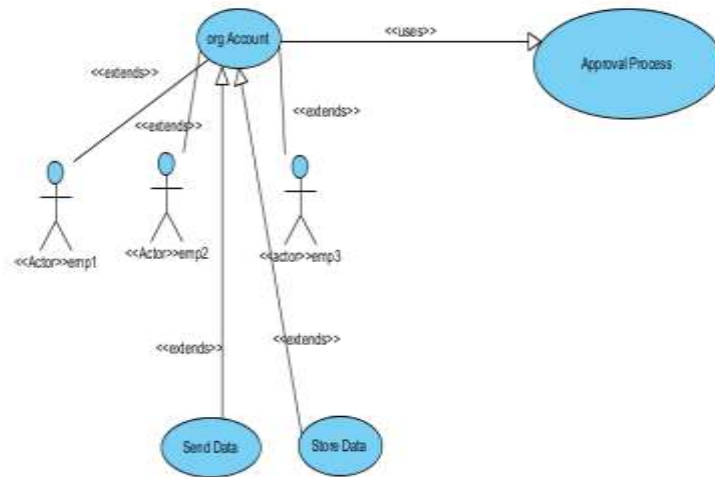


Fig b.1 Use case diagram of private cloud

c. Community Cloud (Grouped Cloud)

This cloud is the simplification of the private cloud because in private cloud same organization’s users can access the cloud and there were no permissions of external users but in community cloud many different users can access the cloud but with different conditions. For example, if two or more than organizations are working together which are independent with each but they can use community cloud during making a project. This computing is managed by them or third-party service provide which is providing services (Rohit Bhadauria, 2013).

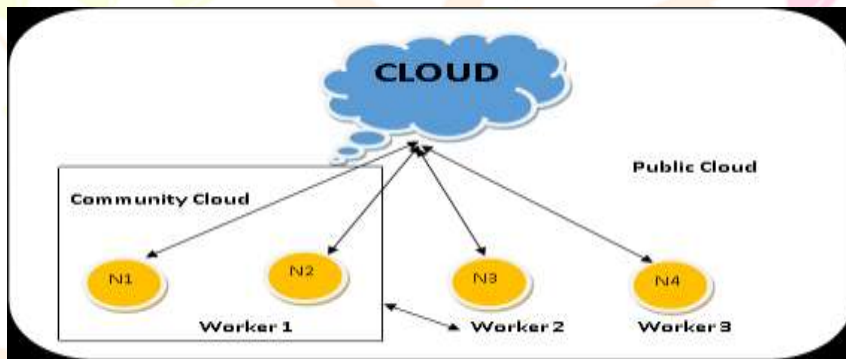


Fig c. Community Cloud

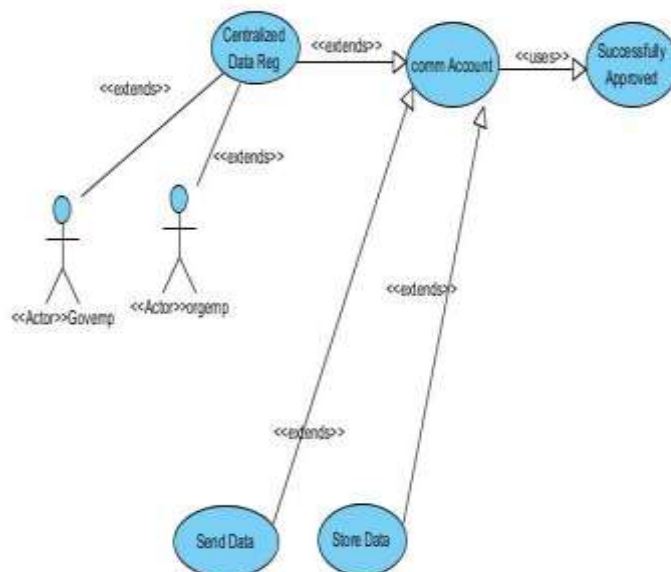


Fig c.1 Use case diagram Community Cloud

d. Hybrid Cloud

This cloud is the combination of the private and public computing. In this computing two or more deployment models, linked such a way that data can be transfer without affecting each other. For example, Google provide some free space in the cloud and millions of user use this free service and it is public cloud and in the same company Google employee also access the cloud service but in different space of cloud it is called private cloud so both are using services which are provided by the same organization, so it is called hybrid cloud.

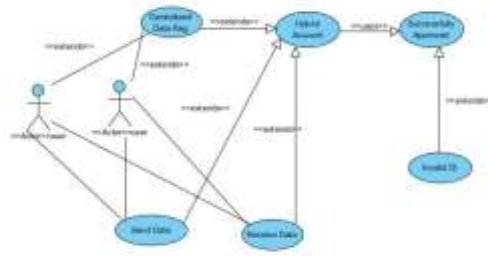


Fig d.1 Use case diagram of Hybrid cloud computing

4. Results and Discussion

I. Clouds and Grids Comparison

Some users think that cloud computing is the extended version of the grid computing which have same work functionality but it is not true both technology are different. In grid computing thousands of computer work parallel to achieve the task and this distribution can software, service components etc. Cloud computing is independent of all these things only required internet to access the data. Grid is not more secure because many users can access same application but in cloud every users have their own account grids often do not deal with end user security (Luis M. Vaquero, 2009).

II. Service Oriented Architecture

Service oriented Architecture is a methodology and teach many things about the services and their characteristics. Services have big roles in everywhere and these services may be hardware, software or web services and these services can be provided by one organization to another organization or in same organization from department to another. The huge demand and benefits of service oriented architecture in every organization so many organization has already started to provide services to another organization like small companies which cannot afford it, one organization takes service of another organization and complete all the formalities and this whole process is called "Service Level Agreement".

III. SERVICE LEVEL OBJECTIVES (SLO)

Service level agreement contains many terms and conditions and consequent. It follows the if else rules which simple meaning that when all both parties will agree to fulfill all the conditions after that one party will provide the service to another else both parties have the right to cancel the agreement (Pankesh Patel, 2009). Licensing agreements, contracts, sharing agreements, and pro forma documents may not provide adequate legal recourse and remedies normally associated with these layers of protection for corporations, and especially as applied to Small and Medium Enterprises ("SMEs") (Johndavid Kerr, 2010).

IV. Service Level and Cloud computing

This type of agreement between cloud service provider (CSP) and the organization or consumers which want to take cloud service from service provider. These are the complete set of the process that how two parties can be agree to provide services.

V. Cloud Service Level Agreements (SLA)

This Service Level Agreement (SLA) is a contract documents between two parties based on the requirements of one party and Cloud Service Provider (CSP).It includes brief terms and conditions upon which the service being provided by the Service Provider (SP).SLA has given a chance to the customers to understanding cloud services which include cloud deployment, cloud security, responsibilities, benefits and disadvantages etc. (S.B.Dash, 2014).

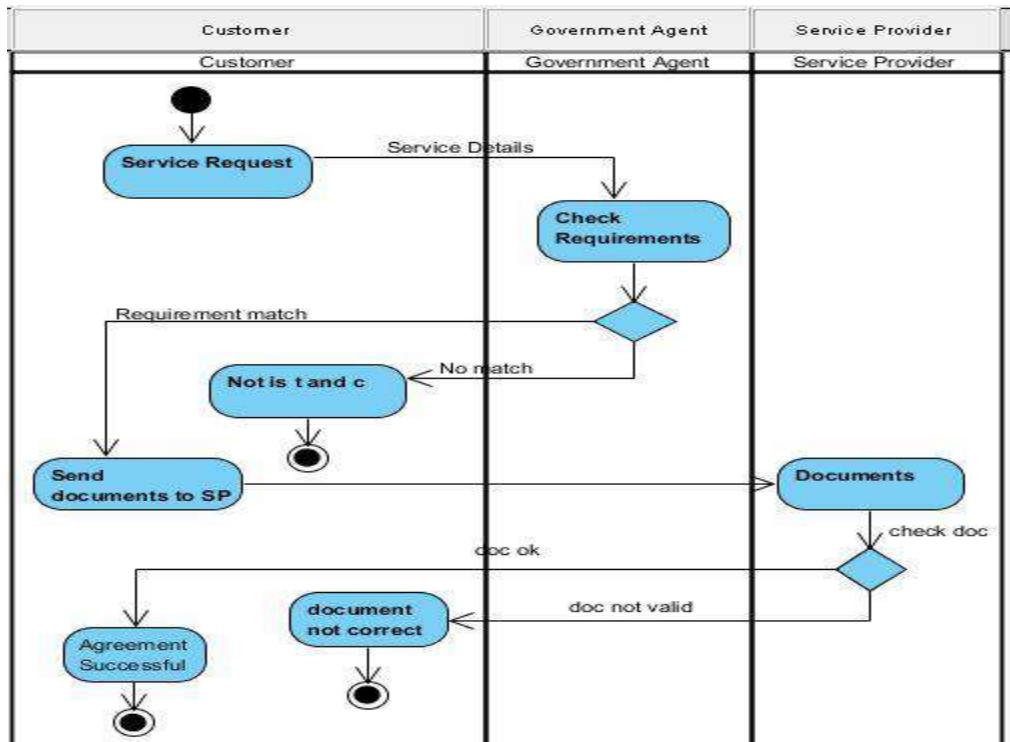


Fig 4. Activity diagram of cloud service level agreement

- The overall, it can be seen from the above diagram that what are the process to complete the service level agreement and take the service from another organization which is cloud service provider and when it can be fail and success and it showing all the way failure of agreement and success of agreement.

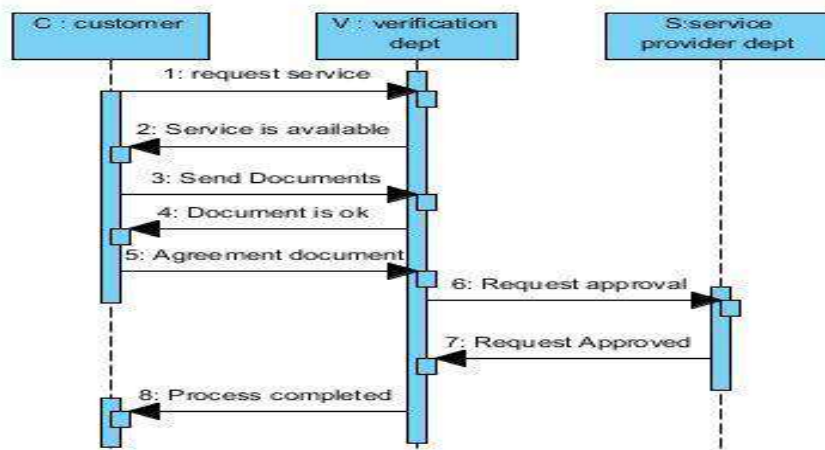


Fig 4.1 Sequence diagram of cloud service level agreement (CSLA)

- The above sequence diagram shows step by step agreement process and also give the number that which is the first step and which one is last.

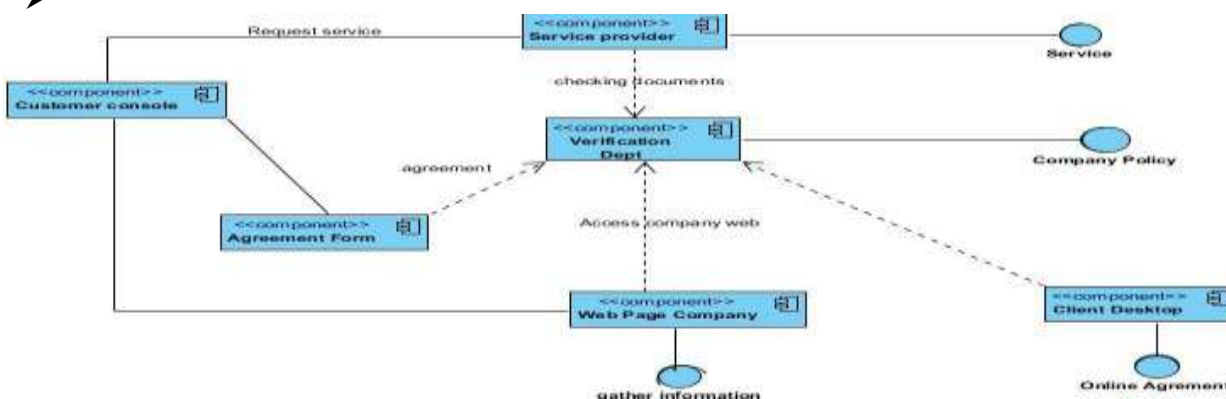


Fig 4.2 Component diagram of cloud service level agreement

- The above component diagram is giving a brief idea to access the component and what can give to the environment and what they expecting from the environment. This is an interaction between customer and service level provider.

VI. Needs of Using SLA

SLA gives a clear idea about the cloud service provider and also it describes the list of cloud services (SaaS, PaaS and IaaS) and it monitors the service quality, performance, priorities and responsibilities from service point of view and it also gives a transparent view to Know about the service management requirements in case of cloud service failure (S.B.Dash, 2014).

VII. Types of Service Level Agreement (SLA)

The based on the types of users and service SLAs are classified into 5 types and which have different roles in providing services (S.B.Dash, 2014).

A) Customer-based SLA: It is the agreement with individual personal group which covers all services used by the users and this is the example of private cloud computing.

B) Service-based SLA: It is the agreement between cloud provider and registered users. For example, Gmail where every have to register themselves before taking advantages of cloud computing.

C) Multilevel SLA: Multilevel SLA consists of different level and each level shows the situations of different customers for same service. Employee and user are the example of this SLA where employee and manager who work is same company but they have different permission to access the service.

D) Customer level SLA: It contains all SLA (Service Level Management) issues relevant to group of particular users.

E) Service level SLA: It contains all SLA (Service Level Management) issues relevant to specific service, in relation with user group.

VIII. Components of SLA

It will describe some components which will provide the services with each other on the requirements of the users (S.B.Dash, 2014).

A) Business level objectives: An organization should know that why this organization wants to take cloud services, what is purpose and what types of services it will use and how long it will use.

B) Responsibilities of both parties: It is important that they should make balance of responsibilities between the cloud service provider and the cloud user and both parties have different role and they should follow the guidelines.

C) Cloud Security: Cloud Computing is not more secure because every hacker try to hack the data of the company so it is the responsibility of cloud service provide that if any one attack on the sites how to solve this problem quickly without affecting any data.

D) Privacy in Cloud: The security point of view, privacy means private, confidential and restricted from unauthorized users. Data authentication is one of the most popular options of security before putting the sensitive data into cloud.

E) Data integrity and Reliability: Cloud computing is the best source to access data from any location so an important aspects of cloud services is availability of user's data with reliability.

F) Performance and Bandwidth cost: Using cloud computing data can be accessed anywhere but there is certain requirements that internet service should be good if any users who are far from cloud providers so they may be take much time to access the data due to the availability bandwidth in the network.

G) Business Continuity/Disaster Recovery: When the users keeps data on the cloud two things come in the mind first one is that data can be accessed from anywhere and the backup which is also the important because if user loss the data they can easily recover from cloud.

H) Maintenance: Maintenance is the part of the service provider but users should know about that which service will be unavailable during the time of maintenance.

5. Conclusion

To sum up, on the division of the cloud computing and methods of service level agreement every cloud services have different terms and conditions and the agreements depends on this division. Cloud service agreement can be between specific customers or organization depends on the requirements. Service level has a new direction where many organizations can work together and can give an application to the users very soon. This cloud services save much time and money because it is so easy that every organization create cloud service so small organizations are taking services from big organization. Cloud service provider are providing more space into the cloud for cloud receiver user but the only problem is that it is not more secure but in the future cloud will come with more security because huge demand of cloud services.

REFERENCES

- [1] Google Cloud Platform. (2015, November 28). Retrieved from <https://cloud.google.com>: <https://cloud.google.com/appengine/docs/whatisgoogleappengine?hl=en>
- [2] java T point. (2015, November 20). Retrieved from <http://www.javatpoint.com>: <http://www.javatpoint.com/android-what-where-and-why>
- [3] Johndavid Kerr, K. T. (2010). Cloud computing: legal and privacy issues. *Journal of Legal Issues and Cases in Business*, 2-3.
- [4] Keiko Hashizume, D. G.-M. (2013). An analysis of security issues for cloud computing. *Journal of Internet Services and Applications*, 1-2.
- [5] Luis M. Vaquero, L. R.-M. (2009). A Break in the Clouds: Towards a Cloud Definition. *ACM SIGCOMM Computer Communication Review*, 51-53.
- [6] MITCHELL COCHRAN, P. D. (2011). GOVERNANCE AND SERVICE LEVEL AGREEMENT ISSUES IN A CLOUD COMPUTING ENVIRONMENT . *Journal of Information Technology Management* , 3-4.
- [7] Pankesh Patel, A. R. (2009). *Service Level Agreement in Cloud Computing*. United States: Kno.e.sis Publications.

- [8] Rabi Prasad Padhy, M. R. (2011). Cloud Computing: Security Issues and Research Challenges. *IRACST - International Journal of Computer Science and Information Technology & Security (IJCSITS)*, 1-2.
- [9] Rohit Bhaduria, S. S. (2013). *Survey on Security Issues in Cloud Computing and Associated Mitigation Techniques*. New York: Cornell University Library .
- [10] S.B.Dash, H. ., (2014). Service Level Agreement Assurance in Cloud Computing: A Trust Issue. (*IJCSIT*) *International Journal of Computer Science and Information Technologies*, 2-3.
- [11] Venkata Narasimha Inukollu, S. A. (2014). SECURITY ISSUES ASSOCIATED WITH BIG DATA IN CLOUD COMPUTING. *International Journal of Network Security & Its Applications (IJNSA)*, 1-2.

