AN ANALYSIS OF CHARACTERISTICS AND ISSUES IN CLOUD COMPUTING

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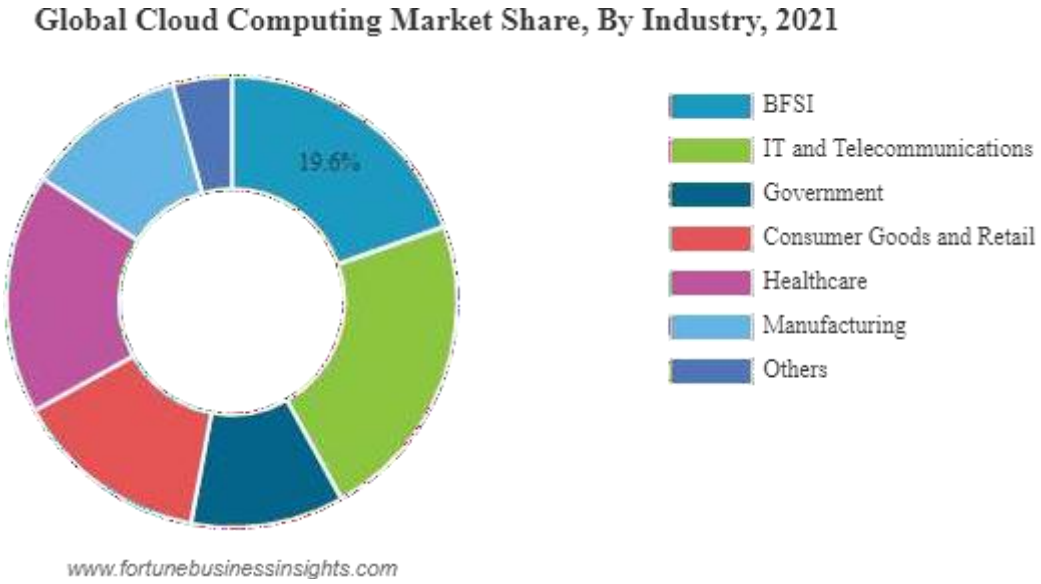
Abstract: Cloud computing is the revolution in IT industry. Internet and cloud computing terms are leading the industry and showing high impact on business. Most of companies are trying to hire the cloud services to gain the advantages with cloud computing. Hiring cloud services in industry may have benefits parallelly also concentrate on security issues. Advantages with the cloud attracting the industry towards it. Even here observing the dawdle behaviour in adopting cloud computing in their company because the security concern associated it. Cloud service providers are trying to lower the issues by updating their techniques. Even though many issues are remained with cloud computing. In this paper focussed on the issues, challenges and threats left with the cloud computing like Privacy, Reliability, legal issues, multi tenancy, compliance, freedom, long term viability, model issues, data security, performance, availability, integrity

Keywords: Privacy, Reliability, Multi tenancy, Compliance, Availability, Integrity

I. Introduction:

Cloud computing is a trending model of delivery computing services to the consumers over the internet. Earlier internet is pictorially represented with cloud symbol until 2008.when a variety of new services started to emerge that permitted computing resources to be accessed over the Internet termed cloud computing. Initially before cloud era, IT product providers provides the services to the customers physically. Now the cloud replaced such system. Cloud computing established a new path to business which made focus on primary task of the organisation rather than secondary like computing infrastructure -like servers, storage, databases, software etc., Focusing on privileged task, productivity increased rapidly there by gain more benefits. Cloud providers providing various services on pay per use model. There is no doubt at all they are cost effective.

According to Fortune business Insight, the global cloud computing market is projected to reach $250.04 billion in 2021 to $791.48 billion in 2028 at a CAGR of 17.9% in forecast period, 2021-2028. This trend showing most of the organisations turning towards to adopt cloud technology [1]. By 2025, there will be over 100 zettabytes of data stored in the cloud [6]. There is no doubt that cloud computing reshapes IT industry and other business as well. One side of cloud computing surveys revealing its advantages and benefits, but other side of the coin showing the fears of it to adopt. Here a major question arises, if this technology is so great why everyone not showing interest to adopt? There is clear distinction between who may adopt and who are not. If we can understand the issues and challenges with cloud computing, one can determine whether to go with cloud or not. In this article, we present an analysis of cloud various issues, challenges associated with cloud computing environment.



II. What is cloud computing?

Cloud computing has many formal definitions proposed by academicians and industry people. According to NIST, 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. Other definitions -cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale. Cloud computing allocates virtualized computing resources which are completely provisioned and managed over the internet. Cloud computing is an emerging computing technology that uses the internet and control remote servers to maintain data and application. Cloud technology is an alternate to the traditional computing technologies. Cloud computing having following essential characteristics, service models, and four deployment models [4]

III. Characteristics of cloud computing:

Following are the characteristics of cloud computing

1.**Resource pooling:** As cloud computing provides services to multiple clients, It is require to maintain number of resources to meet the needs of the clients.

2.**On demand service:** This is another important characteristic. Client can access additional services from the provider on demand. Client can control and manage the computing resources as per their needs.

3. **Easy maintenance:** As it provides the web-based UI, client can easily maintain the provided resources.

4. **Scalability**: It is very essential characteristics of clod computing; this plays important in attract the clients towards cloud. As per the demand, client can change usage of resources for computing. Client may demand additional storage, servers, bandwidth and other computing resources. Dynamically, cloud also scale the resources as per the requirement of the client without human intervention.

5. **Automation:** With automation, administrative tasks will be control and maintain with ease.

6. **Large network access:** Without network there is no meaning to the cloud, since cloud is a multi-tenancy environment it required very large network access to communicate and provide services to the clients

7. **Metered use [3]:** Every usage of computing resources by client will be calculate. Resource utilization can be measured in CPU time, bandwidth usage, monitoring storage usage etc., Cloud can generate the bills for usage of resources. Client should pay the bill in Pay-Per-Use model.

IV. Service Models:

Cloud provides different services to its clients. Client may request either one service or multiple services. Some clouds provide specific services only not everything. But today's cloud providers exposing as they provide anything as service (Xaas).

There are three key types of service models:

1. **Infrastructure as a service (IaaS):** In this model, cloud provides the infrastructure virtually to the customers as per their requirements, In IaaS, client requests the resources like computer power, memory, storage, bandwidth, servers, security devices etc., and pay for the resources as per the usage. Service – Level – Agreement will be in between cloud provider and the client.
   To be commercial successful, the IaaS service must include the following [5]:
   a. Utility style computing service with pay- per- use billing
   b. Superior, world class IT infrastructure and support
   c. Virtualized servers, storage, and network to form a shared pool of resources.
   d. Dynamic scalability of resources
   e. Automation of administration tasks
2. **Platform as a service:** On requesting this model, client can get a set of applications and product development tool from the provider. Cloud consumer may develop application or software locally and deploy in cloud using tools which offered by the cloud. Cloud consumer may develop and deploy software / applications at cloud site. Application may be developed by any 3rd party other cloud and consumer and deploy in cloud. The client could not control and manage the underlying infrastructure of the cloud.
3. **Software as a service:** Cloud providers, offers softwares and applications as a service. Applications may available in template model or they can offer to develop clients required applications from scratch. Applications can be accessed by the client through cloud web portal. Clients do not have any control the underlying infrastructure.

V. Deployment Models:

Following are the deployment models are popular now a days:

Public cloud: Public cloud is open to all to store and access information via the Internet using the pay-per-usage method [5]. Public cloud provides sharable platform accessible to all general public. Common storage is used by multiple tenants.

- **Advantages**: Low cost, Easy to maintain, easy to integrate, location independent, highly scalable and accessible by general public.
- **Disadvantages**: less secure, client has no control of data, performance depends on high-speed internet.
- **Providers: AWS, GCP, Azure, Google APP Engine, IBM cloud etc.,**

Private cloud: Private cloud is also known as corporate cloud. It cannot be accessible by general public. These designed solely for specific organization. Private clouds managed or controlled either by the organization itself or by the 3rd party. These are again classified in to the two based on the location where the cloud was located. 1) On Premise 2) Off premise.

- **Advantages**: high level secured, better performance, client has full control over the cloud.
- **Disadvantages**: Area of operation is limited, skilled persons required
- E.g.: HP Data Centers, Microsoft, Elastra-private cloud, and Ubuntu

Hybrid cloud: This model is formed based on the combining of two or more cloud models. Generally, these Hybrid clouds formed by combining Private and Public clouds. Here activities of organization separated and deploy in different clouds. Critical activities are placed in Private, while non critical at Public. A hybrid cloud is used in finance, healthcare, and Universities.

- **Advantages**: low risk, offers flexible resources, more secure than public cloud.
- **Disadvantages**: Complex model, less secure than Private cloud.
- Example: Google Application Suite (Gmail, Google Apps, and Google Drive), Office 365 (MS Office on the Web and One Drive), Amazon Web Services.

Community cloud: Community cloud allows systems and services to be accessible by a group of several organizations to share the information between the organization and a specific community. It is owned, managed, and operated by one or more organizations in the community, a third party, or a combination of them [5]

- **Advantages**: cost effective, suitable for collaborative organizations, secure than public cloud
- **Disadvantages**: Not suitable for every organization, less secure than Private cloud.

VI. Issues in Cloud computing:

As the cloud providers and cloud consumers are increasing, concerns raising regarding the issues related with cloud computing. Here some of the issues are associated with cloud are listed and described.

Privacy: Since cloud is a multitenancy environment, privacy is a major concern especially in case of public clouds. The virtualized environment is more vulnerable in terms of compromises the privacy. Easily attacker may access privileged information from virtualised environment and there may be chance of leakage of data.

Reliability: Reliability is an issue associated with other issues. There are a variety of types of failures that may affect the success/reliability of a cloud service, including Overflow, Timeout, Data resource missing, Computing resource missing, Software failure, Database failure, Hardware failure, and Network failure [10]. legal issues: Proper study and review should be conducted before agreement taken place CSP and consumer. If the consumer neglect here may face various issues with CSP.

Multi tenancy: Multi tenancy is an issue in cloud. This issue only observed in public and community cloud. Different organisations (cloud consumers) access the common pool of resources provide by cloud, hence there may be chance of interfere the data with another organisation. Due to technical issues may data retrieved or inserted in other organisations area.

Compliance: Cloud providers should comply with the norms and regulation of the standards organisations. Before making an agreement with cloud providers, client should get the information about certifications given for the services. Without ha If the clouds did not comply with the norms and regulation of standards organisations.

Model issues: cloud models are different from each other. Model is also playing very important role providing services.

Data security: Security risks like, snooping, unauthorised discovery, spoofing, Accidental or Malicious deletion, Denial of service, quality of service, Data availability issues are associated with cloud.
Performance: Performance may not be consistent. Performance of the cloud may also be degraded as load increases.

Availability: It is another important issue; clouds may not serve the services 24/7 because of internal technical and network issues. In such cases, we have to wait for the services this may disturb the business.

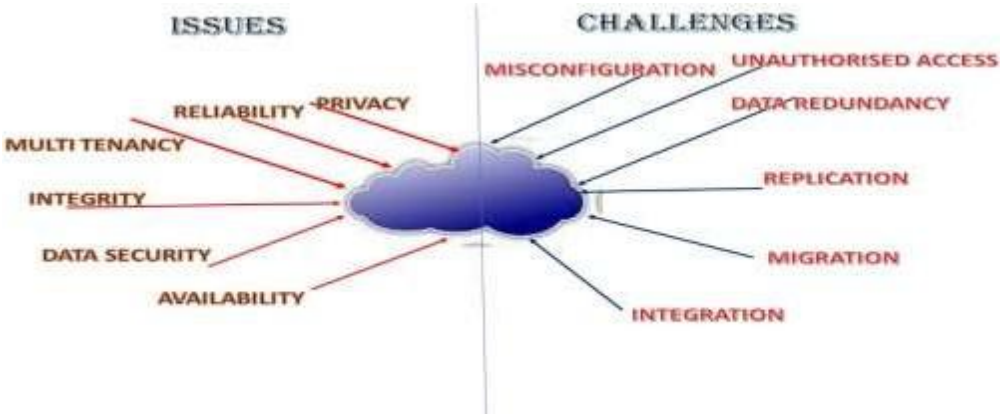
Integrity: There is a chance of two types of integrity issues with cloud. 1) Data Integrity 2) System Integrity. Unauthorised persons may change data or system technical configurations leads to face problems is accessing actual data from the cloud and may chance to loss the data also.

VII. Challenges

According to cybersecurity experts, the most pressing cloud security challenges are misconfiguration of the cloud infrastructure (68 percent); unauthorized access (58 percent); insecure API (52 percent); accounts, services or traffic hijacking (50 percent) and external data sharing (43 percent).[6]

Besides that, the other challenges that prevent the consumers to adopt Cloud Computing are as follows:
Security: Security challenges should be more concern at various level, i.e., Host level and cloud data level. Security challenges at Host level are Host security for IaaS, PaaS, SaaS and cloud data level are Data redundancy, replication, consistency, recovery, backup, fragmentation, Integration.

Migration challenges: Data loss is a challenge during migration or data transformation among the various applications.



Conclusion:
Cloud computing playing vital role in IT industry as well as showing impact on the non-IT related organizations. Cloud providing more services and the features attracting the organizations. Easy to maintain, scalable, cost effective, reduction in initial investment are the important factors making organizations to choose cloud. One side of cloud having advantages but other side it is with so many issues and challenges. Recent Studies have shown that about 20% of the cloud users switch back to internal infrastructure due to security breaches or frustration with the quality of service provided. In this paper we tried to elaborate the issues and challenges associated with cloud. There is necessity to address all these issues and challenges. Once the above mentioned issued are properly addressed, the cloud customer base will be increased and get benefited with the cloud.

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