Recent Challenges and Security Issues on Cloud Computing Environment

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***Abstract*— In computer's world these days cloud computing plays very important role. It gives user facilities like group of things such as software, platform and infrastructure services. Virtualization is the backbone of cloud resource sharing. Security is also a main problem of cloud. Multiple users have their own perception related to the cloud. By using cloud computing user can access resources anywhere by using internet. So this technique is very useful in user's daily life. One of the factors for cloud computing is cloud services which were provided by the cloud (IAAS, PAAS, and SAAS). These services enable users to access infrastructure, platform and software. Even resources are allocated to users according to their requirements. But many people think it is unsafe to use cloud resources and its services. It is unsafe to use cloud because there is no guarantee of information which is controlled or maintained by the vendors. There are some security issues that are noticed in cloud computing. In this paper author has discussed a few issues with cloud computing and the challenges of cloud computing. This paper gives overall investigation of security on data, protection and issues in the cloud. The paper also defines the literature review related to the cloud computing issues and treats. Various security concerns are also discussed in this paper.**

***Index Terms*—Cloud computing, IAAS, PAAS, SAAS, NIST, DDOS, IP Spoofing, SLA.**

I. INTRODUCTION

From the previous concept of deployment models, cloud computing [1] is gaining the popularity. These days, several companies, big enterprises, are enjoying the comforts of cloud services and putting their applications and data into it. This results in more efficiency and effectiveness in developing and deployment and the burden of purchasing and maintaining the infrastructure is no more a requirement. One of the most useful and widely used definition of cloud is NIST as "Cloud computing is a technique that allow convenient, according to users requirement provides network access to computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly allocated and released with least management work. The cloud model consists of five characteristics, three services, and four deployment models."[2] The three service models of cloud are : Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) and deployment models are:

Private cloud, Community cloud, Public cloud and Hybrid cloud.

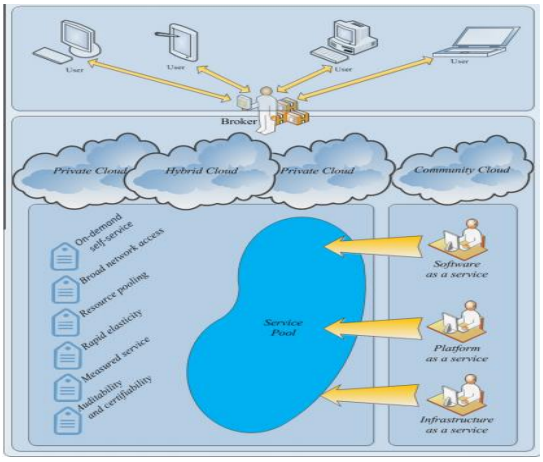

Fig. 1 Cloud computing and its services

But from the user's perspective, cloud computing security is always a major concern. Some of the security issues are discussed in this paper. This paper consists of various parts that includes Cloud's applications, its issues, literature review and some legal issues [3] of cloud computing.

II. APPLICATION OF CLOUD COMPUTING

Some of the applications [5,6]are discussed below in detail:

- By using cloud computing users can access its resources and services anytime from anywhere by using to Internet [6].
- By using cloud computing users don't need to purchase infrastructure and applications. Because User can access these resources or pay them according to their needs. In early time Organizations totally depend on systems for processing their work and users need to purchase all resources and licenses for a long time. In Cloud computing user can take the benefits of all resources without purchasing it. Pay a pay-per-use policy is used in cloud computing [4,6].
- Hardware costs are minimized by using cloud and consumers have no requirements of purchasing the system with large number of space, hard disk etc. [4] [6] [18].
- With cloud computing there is no problem of space. Thus, users can access, unlimited space and can access it by taking it on rent [6] [17].

- The cloud system uses the processing power of less presented system to maximize the speed of the computations [1][6][8]. It has various advantages as compared to traditional techniques, but it also has its own issues that are discussed below.

III. ISSUES

The main issue is security and privacy and these concerns are discussed below in detail [4] [7] [8] [16]. Figure 2. Shows various cloud security issues and are explained in detail.

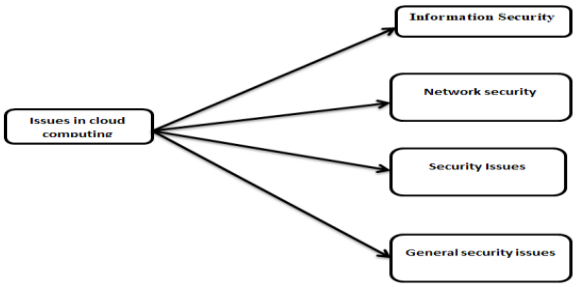

Fig. 2 Issues in cloud computing

A. Information security in cloud computing

It focuses on confidentiality, integrity and availability of data and have no care of the form the data may take [9]. Information Security in cloud computing has various parts that define its issues in detail.

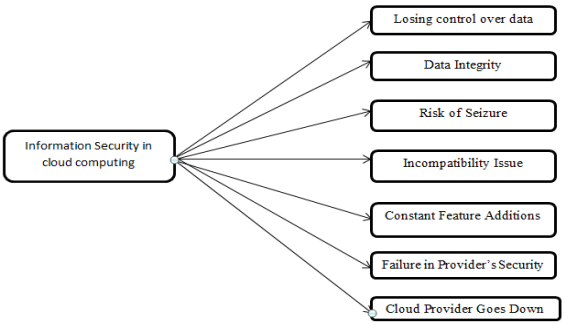

Fig. 3 Types of information security in cloud computing

- Losing control over data: Some banks never want delivered data in the cloud that have no protection in sharing data via communicating with some other system [3][10]. Amazon S3 APIs gives bucket- and object level access, with defaults that only allow authenticated access by the bucket and/or object creator. Therefore, there is full control of customer over who has access to their resources [13].
- Data Integrity: Data integrity is a major security concern that means the data alters only in response to authorized actions. It has been observed that the common standard for data integrity does not yet exists [8]. In the area of computing users are needed to accept the underlying premise of trust. In fact, cloud computing facing biggest concern in trust so most of the companies avoiding it for their data [7].
- Risk of Seizure: In public cloud computing user share the environment in the cloud, may take data at risk of seizure [4][8]. The Encryption of data is only the security against the risk of seizure for the user.
- Incompatibility Issue: Incompatibility issue is the main concern in cloud computing that means services provided by the cloud service provider may be incompatible with service provided by another cloud service provider. For example, Amazon's "Simple Storage Service" [S3] is not compatible with IBM's Blue Cloud, or Google, or Dell [4] [8][13].
- Constant Feature Additions: Constant feature additions always undergo by Cloud applications, and consumer has to keep up to date with application alteration to make sure that these applications are secured. The speed of altering these applications in the cloud affects both the security and Software development life cycle [4] [8].
- Failure in Provider's Security: The cloud provider normally fails in providing security to the portions of its infrastructure– those results in the compromise of subscribing systems. Cloud consists of various objects, and for this configuration, no cloud can provide much more security [3][7]. It is expected that User has to trust provider's security. It is very tough to give the details that help to ensure that the right things are being done [3][7].
- Cloud Provider goes Down: A number of variants have been noticed: bankruptcy that thinks to take the business in another direction. Due to the actions of another company, subscriber takes the risk of losing access to the production system. It is also a risk that data might not be secured in accordance with the service levels to which they may have been previously committed [4].

B. Network security in cloud computing

Network security is necessary to secure data while transmitting between a consumer and computer and also between computer to computer [21][22]. Network security in the cloud is discussed in detail. Figure 4 shows the types of network security in cloud computing that are discussed below.

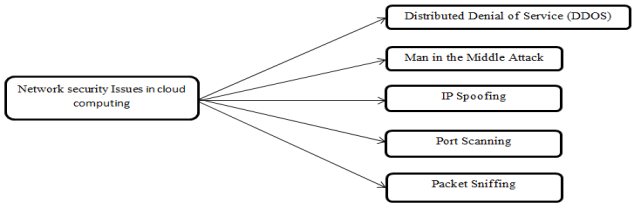

Fig. 4 Types of network security issues in cloud computing

- Distributed Denial of Service Attack: In such type of attack huge amount of network traffic is given to servers and networks and consumers are denied the access to a certain Internet based Service In order to stop hackers from attacking the network, the provider faces blackmail [21][14]. Proprietary DDOS mitigation methods are widely used. AWS help in providing the application Programming Interface to end users, various resources,

best infrastructure that help in making Amazon world's number one retailer [9].

- Middle Attack: In such type of attack, there is the independent connection of the attacker with the victim. Messages send among them, make them believe that both parties are communicating with each other through secure connection, but in reality the conversation between both of them is controlled and managed by the attacker himself [21]. In such cases, users can use secure APIs for accessing the host certificates before logging on the user first time. Users are guided enough for using SSL for all secure conversations [9].
- IP Spoofing: In such type of attack, someone tries to use the IP address of another user without his/her permission. Attacker hacks all the confidential data of the user and has an unauthorized way of accessing the system, and can deliver messages to another system with an IP address that shows the message is coming from a trusted user. [18][19]. Spoofed network traffic cannot send by Amazon EC2 instances [9].
- Scanning of the ports: The cloud provider helps in providing the security group for allowing the flow of traffic from the source to a particular port, then that particular port becomes vulnerable to that scan port. A port is an area which helps in transferring the data in and out, also help in checking open doors for the system [17]. There is no way through which this attack can be stopped because every time searching on the internet opens a port which opens a door for attacking to your system [8].
- Sniffing of packets: It is a communication with the raw network device for packets that interest you. When the software finds interest in a packet that fulfills a certain procedure, it logs it to a file. The most commonly used procedure is "login" or "password" [18][19]. In promiscuous mode this is an impossible thing to accept or "sniff" traffic that is used for a different virtual instance. The hypervisor never deliver any traffic to users that are not addressed to them [9].

C. Security issues in cloud computing

Such type of issues is more complex in a virtualized environment as cloud provider have to keep a trail of security on both the tiers, i.e. in virtual machine security and in physical host security. All the virtual machines residing on the host server become impacted if the physical host server's security becomes compromised [23].

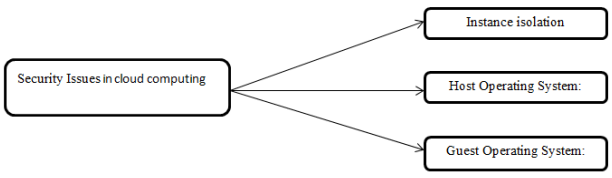

Fig. 5 security issues

- Isolation of systems: Isolation issues help in protecting various instances which are working over equivalent machine but are separated from each other. In cloud computing, virtualization techniques charge different virtual machines for various organizations for working on the identical platform by sharing the physical resources with each other.
- Host Operating System: Bigger enterprises ought to maintain the business plans which may be used by different authentication for gaining the access for building and configuring different hosts by cloud server [18].

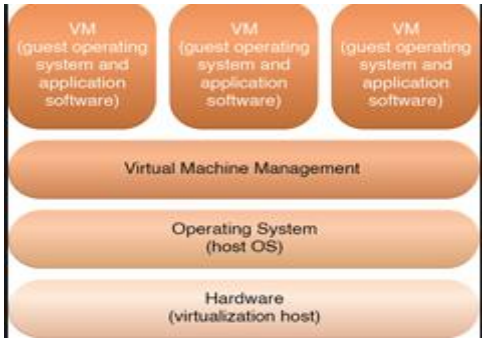

Fig. 6 Host operating system [18]

- Guest Operating System: Consumers are totally responsible for maintaining virtual instances[26]. Consumers have rights to control on resources, applications. AWS has no rights to customer instances and have no permission to log into the guest OS.

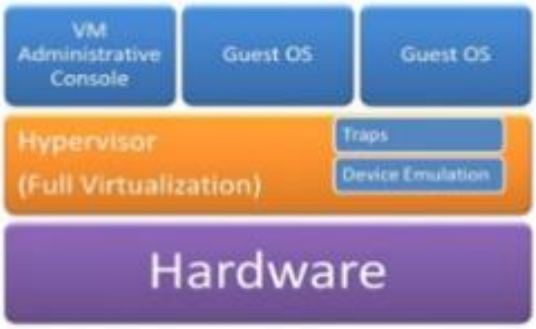

Fig. 7 Guest operating system [26] security is necessary to secure data while transmitting between

D. General Security issues in cloud computing

There are some other general issues of security, they are being deal by cloud computing these days and need to be taken care. These are listed as below.

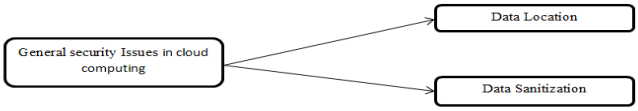

Fig. 8 General issues in cloud

- Data Location: Users using the cloud don't know where their data have been exactly kept or hosted or in which country their data is being residing [3][4][8]. Thus, it

becomes very difficult for the user to get information about his data that he is storing on the cloud.

- Data Sanitization: In this process sensitive information is being removed from a system which is used to store information. In the environment of a cloud, customers using services are wondering about the information that is placed and how it is maintained by the cloud. So this is also one of issues which should be handled for making the user know about the process [29].

E. Legal issues

Some of the legal issues of cloud computing are being discussed as under. The legal issues consist of various types such as Jurisdictional Issues and Cloud Stakeholder Rights that are shown in figure.

- Jurisdictional Issues: In a cloud environment, resources are the provided to the users are not fixed to any location or they don't have any specific data center. They are being migrated between different locations during their lifetime [27,29]. So the decision of where to keep the resources or where to do migration these resources may be based on various factors that may include load balancing, networks, data center for their performance and availability or even on the characteristics of the clients.

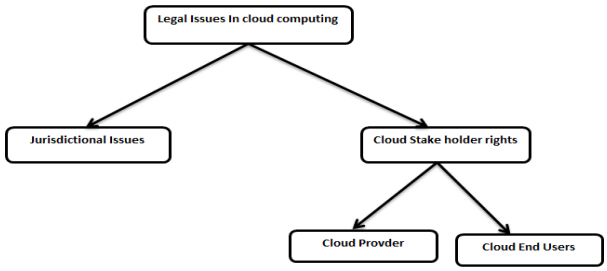

Fig. 9 Legal issues in cloud computing

- Cloud Stakeholder Rights: The cloud stakeholder rights contain 2 main things which are discussed as:
- Cloud Provider: Because of migration [18] of host may change the legality activities taking place on that host, to what extent is she liable for illegal activity and what restrictions should be on the provider that results in such a move?
- Cloud Resource End Users: Users of different resource in a cloud-based system can be expected to know when her activities are illegal?

IV. LITERATURE REVIEW ON CLOUD SECURITY AND THREATS

Literature review of cloud security and threats are discussed in detail in table I that is given below:

TABLE I. Literature review on cloud security and threats

Name of author	Description
S. Subashini et al in [6]	The author has done surveys on SQL injection and storage insecurity. The author has further investigated about security and privacy issues in cloud with the special relationship between the cloud provider and cloud user. There are three parties that are joined together in a relationship. Most of the researches which are done earlier discusses about the cloud security from a collective viewpoint outside a cloud.
Gartner et al in [10]	The author discussed an idea that whenever the user is making a deal with the cloud vendors, users must ask the cloud vendor for 7 main different security issues : Data location, data segregation, long-term viability, Privileged user access, regulatory compliance investigative support and recovery.
V. Kavitha et al in [29]	The has discussed about the investigations on security issues in cloud computing delivery models and has given a detailed analysis of different issues related to security in cloud computing [8]. Further author has explored more about the security issues in cloud computing from various perspectives which may include various issues related to security, cloud architecture, various delivery models.
Hamdaqa et al in [25]	The author described that the cloud computing is not considered as a new emerging technology or any concept that came into existence in recent years indeed its having its root from very earlier time when John McCarthy described cloud computing as one of the abilities for providing resources to the user as one of the utility.
Espadas et al in [17]	The author describes cloud computing as the 5th characteristic of cloud that is suggested by the Cloud Alliance. Cloud computing help in modeling different models for policy-driven isolates, governance, service levels, charge back/billing, enforcement and segmentation of different users which are using the cloud services.
Takabi et al in [19]	The author helped in designing and informing about various rules that

	should be considered for security and various policies of cloud service vendors. However, the author has developed a framework which is self-administered and helps in supplying various services to cloud users with some security and policies which should be maintained by the cloud provider.
Worm et al in [21]	The author successfully helps in providing 3 decision criteria in a cloud that may include executing cost, resting time to deadline and service availability at the decision instant. With the help of such response time and with the availability of services, various dynamic programming is being used for achieving the objectives of cloud, which is necessary for saving results for selecting the best services between all other services available to the user.
Zhou and Mao et al in [28]	The author has proposed an approach for semantic cloud-based web services dealing with Bayesian decision. The authors with the help of Bayesian approach help in anticipating the web service for semantics which may help in discovering the graphs generated on the basis for the use of the implementation in a cloud and also obtaining the relations on the basis of graph which may be formed with the help of the Markov chain.
Sinnema & Deelstra et al in [24]	The author has discussed the basis of modeling variability and cloud feature models which are represented as the mechanisms for explaining about the services and requirements together for preparing definite cloud service selection process.
Klein et al in [9]	The author has discussed about an approach which is used for considering separately non-network and network QoS of services. For such a technique author has estimated the real network latency which has desired services and have low time complexity. Author has also introduced an equation for QoS for calculating the QoS network, their latency, and their transfer rates. At the end of the genetic algorithm approach, design of a selection based algorithm is being proposed for generating various services, and the results are being compared with the Dijkstra algorithm
Wang et al in [7]	The author has introduced swarm optimization in which integer array coding is being applied for achieving a fast method to solve the CCSC problem. For achieving this goal author has emerged the operators with variables of binary decision used for eliminating the services which are improper from the search space.

CONCLUSION

The phenomenon of cloud is making huge engrossment in everywhere due to its features like scalability, small workload for customers, quick and comfortable access of resources and cheaper cost. It provides various benefits to the user. Users are getting to know about this technique from various sources, many consumers have their perception that cloud is not a secure area to work on, though some are finding it much more secure than other security policies, mainly those areas which don't have enough resources for securing themselves. Many big organizations and government organizations are holding back to the cloud environment because they feel it unsafe for storing their data. So if cloud computing wants to get accepted by consumers, all other areas to create big organizations, it should develop some skilled standardization of security and also certification should be done by third parties for ensuring that standards are properly met.

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