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CONCERNS FOR SECURITY IN MIGRATING TO CLOUD COMPUTING**NITASHA HASTEER****ASST. PROFESSOR****DEPARTMENT OF I.T.****AMITY SCHOOL OF ENGINEERING & TECHNOLOGY****AMITY UNIVERSITY****NOIDA****DR. ABHAY BANSAL****PROFESSOR & HEAD****DEPARTMENT OF I.T.****AMITY SCHOOL OF ENGINEERING & TECHNOLOGY****AMITY UNIVERSITY****NOIDA****TANYA SHARMA****B. TECH (IT) STUDENT****DEPARTMENT OF I.T.****AMITY SCHOOL OF ENGINEERING & TECHNOLOGY****AMITY UNIVERSITY****NOIDA****ABSTRACT**

Cloud Computing is slowly and steadily becoming the foundation of many corporate dealings. Organisations are trending towards migrating its data and applications onto cloud technology because of the perks being offered by using this remotely-hosted service. Though, cloud computing has been around since mid-2000, it has only become popular now with two internet giants establishing themselves in the field of remote-computing – Google and Amazon. “With great power, comes great responsibility” fits appropriately to this situation, as cloud computing along with being a popular service is also a major concern for the security of the enterprise’s data. Thus, it is necessary to delve deep into the various security issues put up regarding the cloud platform and find a way to tackle them. This paper focuses on the security breaches to sensitive data in the Cloud Computing Environment. It highlights the concerns of the major giants rapidly reaping the benefits of this technology.

KEYWORDS

Analysis of Platforms; Cloud Computing; Security Concerns.

INTRODUCTION

Cloud Computing is the emerging technology which maintains its focus on providing and sharing virtualized and highly available computing resources ,i.e. networks , servers , applications and data , among a group of cloud users . The two main entities of the cloud architecture [1] are –

- Cloud Provider – who works on distributing cloud services, as on demand, and collecting as well as maintaining data from various users in data centres.
- Cloud User – who sends data to Cloud Provider and also requests for either of the cloud services.

Many people are still not aware of the services provided by the cloud platform. If you are an enterprise and are currently hosting a large number of applications via internet, then your monetary resources required for server storage [2], computers processing for the requests coming from the users, electricity needed to run those computers, physical storage space such as an office is required for the purpose of hosting these applications on web. Also, employee would be required to handle the computer equipment and for proper functioning of the service. Problem also arises when a customer requests for a certain application which requires a different operating system than installed in the computer. In that case, you would be required to have more computers than required with a different OS on each system. But with the use of cloud computing and virtualization technology, the user can access the only server of the enterprise by the use of virtual machines, where several users are under the impression that they are working on a remote server. These users take the services provided by the cloud on a pay per use basis [3] instead of splashing lots of money on resources alone. Since, the location of the remote server is unknown to the cloud users, they have collectively termed it as “cloud”.

Cloud computing service framework [4] is categorized in following:

- Infrastructure as a Service (IaaS) – For providing hardware infrastructure services like disk storage, virtual servers, etc.
- Platform as a Service (PaaS) – Provides development platforms on cloud for user’s application.
- Software as a Service (SaaS) – Offers software services on cloud, on a pay per use basis.

Various virtual machines are deployed on a single server, from where cloud users can use and pay for the services they may take and need not worry about the budget overheads such as data storage and infrastructure. It is possible for the security concerns and threats to arise because of various parameters, some being - use of virtual machines[5] instead of physical systems , organisation losing its control over Information Technology(IT) infrastructure and letting a third party have complete access to it , and most importantly , all processing and computing being done on a single physical remote server.

SECURITY CONCERNS

Some security concerns which will require attention are as follows –

1. A huge amount of data is being transferred from virtual machines to the remote server and vice-versa. In this case, it is important to keep a check on various malicious users who may breach the security and pose a threat to the authenticity of data, raising questions about security isolation in cloud environment.
2. Storing data collected from every cloud user onto a single physical remote server gives way to a huge responsibility to the cloud provider, as he is entitled to ensure the integrity and availability of their data and thus, prevent it from any loss. Therefore, it is up to the cloud provider to safeguard his system

- against any data lock-in [6] and if in case it suffers from data loss, it may be well equipped with data recovery mechanisms. Relying on data which may be lost may lead to loss of trust on user's end and heavy financial losses to the organisation. The legalities [7] of data are also challenged. Thus, it is necessary to keep it safe from data leakage and data loss [7] [3].
3. One major concern that constantly bugs the cloud management is ensuring privacy against unauthorised users to access the information and modify it without the knowledge of owners. For this, many security mechanisms like firewalls, intrusion detection and prevention systems are used and rational use of filters [8] is made. But what if the malicious user is on the same side of firewall instead of being outside it???? Such an action would wreak havoc on company's market image, increase monetary losses and losses incurred due to low or no productivity [9]. Also it is recommended [9] that strict verification of cloud employees is done and their work is kept transparent.
 4. Any person with a valid payment option such as [10] credit or debit cards is eligible to use the services of cloud. Therefore, no authentication is checked at the user level which provides various hackers and cyber criminals a chance to attack cloud users and vendors. Cloud Security Alliance[10] have proposed the key areas of security issues as hosting unauthenticated & modified data, denial of service(DOS) attack, and password and key cracking and so on. Some of the major causes due to which these attacks are possible are poor validation of users during registration and lack of mechanisms to monitor and prevent fraud from provider's end.
 5. An account is provided to the employee for the sole purpose of efficient management of data and services by the employee for the organisation. Account protection should be the foremost requirement, so as to protect important credentials and information of the employee. But, the cloud computing environment is prone to various Account Hijacking [11] techniques. Attackers, by the means of gaining account credentials, can malign the industry image of that employee as well as use his account to access critical areas [11] of the deployed cloud. This concern calls for an urgent implementation of various risk analysis, assessment and management [12] techniques and deploy systems that provide quick response to any unauthorised activity that is identified within the organisation's system.
 6. The basic need for a cloud arises in order to maintain and share your data in the form of application interfaces with other cloud users. These applications are developed and monitored by various organisations in order to serve the user's needs with multiple services. Thus, the responsibility to secure these interfaces [7] rests with these organisations and third-party agencies [7]. Developing the APIs on a simple security structure poses threat and arise information related risks in organisations, therefore questioning the integrity, security, reliability of the applications. The basic cloud security framework [13] of these applications must be modelled keeping in mind the protection mechanisms against accidental and malicious [7] authorization risks.
 7. Cloud environment enables multiple users to be logged on at the same time and access various value-added services given by the provider. This feature calls for a much more efficient infrastructure and better compatibility among various components. There is also a need for stronger compartmentalization [7] so as to provide required isolation among all cloud users. Poor isolation and lack of defence techniques gives unauthorised users the much needed chance to affect operations of other users. Shared components [7] such as disk partitions, CPU caches and GPUs provide a gap through which the attackers fulfil their malicious attempts. These concerns can be tackled with the help of appropriate SLAs and by removing compatibility issues between the shared components. Thus, efforts need to be made in order to protect and secure the vulnerable systems and services handled by cloud.
 8. These were some of the concerns which are known and are expected to occur during the lifecycle of the cloud. But we also need to keep a check on those concerns and risks, which may occur unexpectedly and are unknown [10]. It is recommended to focus on such risks, because if overlooked, they may pose serious threats to system as well as data and all the stakeholders of the cloud. The famous Heartland Payment data breach [14] is one of the examples, where ignorance to security warnings resulted in a major information breach, for which the company incurred huge losses. Vulnerable systems of Heartland Payment Systems were hacked and credit card information of several million users was stolen in order to duplicate cards and use them in various transactions. The organisation along with bearing losses of about half a billion dollars, also lost the market image that it had made over the years. Had they been more careful and attentive to the security breach and their warnings, this event could have been avoided. Thus, it makes necessary for all the organisations to learn from the mistakes that Heartland made, and make their security infrastructure strong enough to prevent any breaches. It can be done by constant monitoring of data access, checking the details related to various security components such as firewalls, intrusion detection systems, honeypots, patch levels [10], etc.
- These security concerns can play havoc if attacker's intentions are not well. This calls for a need to implement stronger security techniques of the likes of Single Sign-On [15] which prevents you from signing on to various sites at the same time. Instead, the users need to authenticate to a single account through which it can access the very same sites without paying heed to security issues related to privacy. Also, organisations and individuals may choose to use Virtual Private Networks for the purpose of communicating with each other in a cloud. These are some of the reasons as to why organisations are still hesitant on accepting this technology and migrating their data to cloud.
- Some researchers have also proposed various security models [16] to defend the cloud environment. They suggest that data processing and data storage should be done by two different independent service providers, which would ensure a required control over frauds and failures and keep a check on misuse of excessive control on the part of one service provider. Based on similar models are Tunnel Model, Migration Model, and Cryptography Model. Also, it is required to use advanced cryptographic and encryption algorithms like digital signatures, hash algorithms, message authentication codes, encryption techniques like DES and AES, and a well based PKI architecture to defend the cloud against all attacks.

ANALYSIS OF PLATFORMS

A brief comparison between three main existing public clouds based on different service models would help us know more about the main domains that need to be researched and looked upon. After a detailed comparison, it was found that each of the cloud platforms has its own set of pros & cons.

Google cloud (based on SaaS model), though having a higher reliability and scalability rate scores low on data security and copyright protection [17]. Whereas, **IBM Blue Cloud** (based on PaaS model) provides highly reliable services and is less vulnerable as compared to the rest of the two cloud platforms. But, less scalability in terms of its architecture prevents it from surpassing others [17]. **Amazon Elastic cloud** (based on IaaS model), on the other hand, is true to its name. Providing flexible architecture and highly virtualised environment based on XEN technology, its elastic nature has been a boon for the e-commerce users. Even though it takes various measures such as taking help from Virtual Private Networks and using Public Key Infrastructure (PKI) management, still it falls behind in preventing security breaches aimed at its system [17].

CONCLUSION

This paper identifies the major security concerns over the vulnerabilities of data in the Cloud Computing Environment, and stresses on the need and mechanisms that are required to tackle them effectively. It also highlights a brief comparison and security risks related to some of the well known existing cloud infrastructures.

Though this domain is well under research and experts have managed to partially clear the doubts that are continuously bugging our minds, but there still remains a need to form a strong Cloud Security Model which can challenge previous security frameworks and prevent the cloud data and applications from any security breach.

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