
Systematic Review of Security issues on Cloud Computing

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ABSTRACT

In Cloud computing environment, both applications and resources are delivered on demand over the Internet as services. Cloud Computing offers various service models as well as deployment models. The service models include infrastructure as a service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) whilst the deployment models consist of; Public, Private, Hybrid and Community Cloud. One of the most significant barriers to adoption of cloud computing technology is data security which is compounded by issues including compliance, privacy, trust, and legal matters. Data security is particularly important to cloud computing because data are scattered in different machines and storage devices such as wireless sensor networks and smart phones. To make the cloud computing to be adopted by users and enterprises, there is a need to address the security concerns of the users and make cloud computing a trustworthy environment.

Keywords: Security, Cloud Computing, IaaS, PaaS, SaaS, Data, Users, models

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1. INTRODUCTION

Cloud computing has been envisioned as the next generation paradigm in computation. In the cloud computing environment, both applications and resources are delivered on demand over the Internet as services. Cloud is an environment of the hardware and software resources in the data centre's that provide diverse services over the network or the Internet to satisfy user's requirements. The explanation of "cloud computing" from the National Institute of Standards and Technology (NIST) is that cloud computing enables 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. According to the explanation, cloud computing provides a convenient on-demand network access to a shared pool of configurable computing resources. Resources refer to computing applications, network resources, platforms, software services, virtual servers, and computing infrastructure.

Cloud Computing can be explained as a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources such as networks, servers, storage, applications and services that can be rapidly provisioned and released with minimal management effort or services provider interaction. Cloud Computing offers various service models as well as deployment models. The service models include; Infrastructure as a service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) whilst the deployment models consist of; Public, Private, Hybrid and Community Cloud.

2. LITERATURE REVIEW

There are numerous security mechanism that have been proposed by different researchers. We present a few of them here,

2.1 Rabi Prasad Padhy,

Cloud computing is an architecture for providing computing service via the internet on demand and pay per use access to a pool of shared resources namely networks, storage, servers, services and applications, without physically acquiring them. So it saves managing cost and time for organizations. Many industries, such as banking, healthcare and education are moving towards the cloud due to the efficiency of services provided by the pay-per-use pattern based on the resources such as processing power used, transactions carried out, bandwidth consumed, data transferred, or storage space occupied etc. Cloud computing is a completely internet dependent technology where client data is stored and maintain in the data centre of a cloud provider like Google, Amazon, Salesforce.com and Microsoft etc. Limited control over the data may incur various security issues and threats which include data leakage, insecure interface, sharing of resources, data availability and inside attacks. There are various research challenges also there for adopting cloud computing such as well managed service level agreement (SLA), privacy, interoperability and reliability. This research paper outlines what cloud computing is, the various cloud models and the main security risks and issues that are currently present within the cloud computing industry. This research paper also analyses the key research and challenges that presents in cloud computing and offers best practices to service providers as well as enterprises hoping to leverage cloud service to improve their bottom line in this severe economic climate.

2.1 S. Kumar,

Cloud computing is the development of parallel computing, distributed computing, grid computing and virtualization technologies which define the shape of a new era. Cloud computing is an emerging model of business computing. In this paper, authors explore the concept of cloud architecture and compares cloud computing with grid computing. We also address the characteristics and applications of several popular cloud computing platforms. In this paper, we aim to pinpoint the challenges and issues of cloud computing. We identified several challenges from the cloud computing adoption perspective and we also highlighted the cloud interoperability issue that deserves substantial further research and development. However, security and privacy issues present a strong barrier for users to adapt into cloud computing systems. In this paper, we investigate several cloud computing system providers about their concerns on security and privacy issues.

2.2 Subashini and V Kavitha

In 2010 S Subashini and V Kavitha proposes a security framework by different methods provided dynamically, that one of the components of this framework refers to provide data security by storage and access to data based on meta-data, which is similar to storing related data in different areas based on meta data, and if the destruction of user data takes place, it can be retrieved. Each part of the framework in "security as a service" is provided for practical applications by providers of security as a layer or multiple layers of required applications.

2.3 V. Krishna Reddy and DR. L.S.S. Reddy

In 2011 V. Krishna Reddy and DR. L.S.S. Reddy proposed the security problems at different levels of the architecture of cloud computing services have been studied. Security of customer-related data is a substantial need for services which is provided by each model of cloud computing. They have studied matters of on-going security software as a service (SaaS), platform as a service (PaaS) and Infrastructure as a Service (IaaS). This paper focuses on the use of cloud services and security for working cross-domain Internet connected.

2.4 Jan de Muijnck

In 2011, Jan de Muijnck-Hughes proposed a security technique which is known as Predicate Based Encryption (PBE). PBE represents a family of asymmetric encryption and originates from Identity Based Encryption. This technique integrates Attribute Based Access Control (ABAC) with asymmetric encryption, thereby permitting a single encryptor/multi decryptor environment to be realized using a single scheme. This Predicate Based Encryption focuses its implementation at both Platform as a service and Software as a service. This proposed technique also precludes unwanted exposure, unwanted leakage and other unwanted breaches of confidentiality of cloud resident data.

2.5 Venkata Sravan et.al

In 2011 Venkata Sravan et.al wrote a paper titled Security Techniques for Protecting Data in Cloud. The aim of this paper is to understand the security threats and identify the appropriate security techniques used to mitigate them in Cloud computing. The research identified a total number of 43 security challenges and 43 security techniques. The most measured attribute is Confidentiality (31%) followed by Integrity (24%) and Availability (19%).

2.6 Ali Asghary Karahroudy

In 2011 Ali Asghary Karahroudy wrote a paper titled Security Analysis and Framework of Cloud Computing with Parity Based Partially Distributed File System. This paper proposed a technique called Partially Distributed File System with Parity (PDFSP) which is a protocol developed as a modification on the existing GFS/HDFS. This PDFSP has four main components; Client Access Machine, User Public Machine, Cloud Management Server and File Retrieval Server. All these components work together to ensure data being transmitted does not get into wrong hands. This paper addressed the three aspects of security which are Confidentiality, Integrity and Availability.

2.7 Punyada M. Deshmukh et. al.

In 2012 Punyada M. Deshmukh et. al. wrote a paper. In this paper they have proposed a system which ensures the data storage security using a distributed scheme. A set of Master servers are used which are responsible for processing the users requests. File chunking operation is performed in order to store replicas of file at Slave server providing backup for file recovery. Unlike the previously proposed systems, efficient and dynamic data operations are performed by users. This efficiency is achieved by imparting the data blocks for different users. The functionality is extended to the Android users and the chatting application is included to add ease and comfort to the working environment of users.

2.8 Nabil Giweli

In 2013 Nabil Giweli proposed a solution based approach referred as Data Centric Security approach. This approach aims at providing security at the data level hence the data are self-describing, self-defending and self-protecting during their lifecycle in the cloud environments. This approach gives the entire responsibility to the data owner to set and manage the data privacy and security measures. This proposed solution is based on Chinese Remainder Theorem (CRT) and it utilizes symmetric and asymmetric encryption techniques. In this paper, the proposed solution is proven to be very efficient as it does not require complex key derivation methods and the data file does not need to be encrypted more than once.

2.9 Miao Zhou

In 2013 Miao Zhou outlined 5 techniques to provide security and integrity of data in cloud computing. These techniques include; Innovative tree-based key management scheme, Privacy enhanced data outsourcing in the cloud, Privacy preserved access control for cloud computing, Privacy enhanced keyword search in clouds and Public remote integrity check for private data. This paper adopted Keyword Searching Mechanism which enables efficient multi-user keyword searches and hides the private information in the search queries [5]. An encryption scheme for a two-tier system was presented to achieve flexible and fine-grained access control in the cloud.

The experimental results indicated that the proposed scheme is efficient especially when the size of the data file is large or the integrity check is frequent.

2.10 Sudhansu Ranjan Lenka et.al

In 2014 Sudhansu Ranjan Lenka et.al wrote a paper titled "Enhancing Data Security in Cloud Computing using RSA Encryption and MD5 Algorithm. As the title of the paper suggests; they implemented both RSA Algorithm and MD5 Algorithm. In this paper, the RSA Algorithm is used for secured communication and file encryption and decryption purpose whilst MD5 Algorithm is used for digital signature as well as covering the tables for unauthorized users. The two algorithm proposed provides the three (3) aspects of security which are Confidentiality, Integrity and Availability.

2.11 Aastha Mishra

In 2014 Aastha Mishra proposed an Advanced Secret Sharing Key Management Scheme. The aim of this paper is to propose a more reliable decentralized light weight key management technique for cloud systems which provide more efficient data security and key management in cloud systems. Security and privacy of user's data is preserved in the proposed technique by the replication of key share among several clouds by the use of secret sharing approach and using a voting method to check the integrity of shares. In this paper, the technique used also brings to bear better security against byzantine failure, server colluding and data modification attacks.

2.12 Nesrine Kaaniche

In 2014 Nesrine Kaaniche wrote a paper titled; Cloud Data Storage Security based on Cryptographic Mechanisms. In this paper, Nesrine proposed two (2) techniques to secure data which are ID-Based Cryptography (IBC) and CloudaSec. With the ID-Based Cryptography, the paper proposed to use each client as a private key generator which generates his own ID-Based Cryptographic Public Elements (IBC-PE). These IBC-PE are used to compute ID-based keys and also serve to encrypt the data before their storage and sharing in the cloud [8]. With regards to CloudaSec, there is a public key based solution which proposes the separation of subscription-based key management and confidentiality oriented asymmetric encryption policies. The CloudaSec aids scalable and flexible deployment of the solution as well as strong security guarantees for outsourced data in cloud servers. It is analysed and understood in this paper that the cryptographic operations at the client side are acceptable compared to the upload operations and do not carry exhaustive computational capacities. For example, a 8×10^5 bytes of data size requires only 0.1 seconds to be enciphered, compared to 10 seconds to be uploaded. Therefore the encryption procedures involve 1% from the Openstack upload overhead.

2.13 Afnan Ullah Khan

In 2014 Afnan Ullah Khan proposed a technique known as Access Control and Data Confidentiality (ACDC) in his paper titled Data Confidentiality and Risk Management in Cloud Computing. The aim of the paper was to develop a novel scheme that would enforce access control policies on cloud computing scenarios. He used a scenario in Medical/Health care where he came out with the following compositions; Data Owner (Medical centre), Data Consumers (patients, nurses, doctors etc.), Infrastructure Provider and Trusted Authority. The paper focused on Infrastructure as a Service as its deployment model whereas data confidentiality and authentication were achieved through the proposed technique.

2.14 Karun Handa et. al.

In 2015 Karun Handa et. al. described that Cloud Computing is a technology that readily makes available resources that otherwise may require huge amount of investment. Besides, it increases the availability of resources since anyone can access the data using web. But this advantage comes at a cost. Firstly, the data is uploaded insecurely which has a high risk of being hacked by some malicious people. Secondly, the data saved at remote servers is under the surveillance of unknown people who can do anything with our data. So, these data

security risks are causing a hindrance in the development of the field of cloud computing. Thus, this paper has designed a scheme that can help, solve this issue.

2.15 Sarojini et.al

In 2016 Sarojini et.al proposed a technique known as Enhanced Mutual Trusted Access Control Algorithm (EMTACA). This technique presents a mutual trust for both cloud users and cloud service providers to avoid security related issues in cloud computing. The aim of this paper is to propose a system which include EMTACA algorithm which can assure enhanced guaranteed and trusted and reputation based cloud services among the users in a cloud environment. The results of this paper showed data confidentiality, integrity and availability which is the three most important aspect of data security was achieved.

2.16 AL-Museelem Waleed, Li Chunlin

In 2016 AL-Museelem Waleed, Li Chunlin assesses how security and privacy issues transpire in the context of cloud computing and examines ways in which they might be addressed. This paper aims to solve privacy and security issues in cloud computing using UEC (Ubuntu Enterprise Cloud). The methodology used involves encrypting and decrypting data to ensure privacy and security in the cloud.

2.17 Dimitra A. Geogiou

In 2017, Dimitra A. Geogiou wrote a paper to present security policies for cloud computing. The purpose of the security policies is to protect people and information, set rules for expected behavior by users, minimize risks and help to track compliance with regulation. The paper focused on Software as a Service. The paper presented a detailed review and analysis of existing studies as far as security is concern in cloud computing. With Dimitra's review of existing threat, he focused on the once that are not applicable to conventional systems. To be able to identify new rules that supposed to be integrated in the cloud policy, a methodology was proposed for assessing different threats in the cloud. This paper scrutinized the security requirements of a cloud service provider taking into consideration a case study of E-health system of Europe.

3. CONCLUSION

Cloud Computing is a relatively new concept that presents a good number of benefits for its users; however, it also raises some security problems which may slow down its use. Understanding what vulnerabilities exist in Cloud Computing will help organizations to make the shift towards the Cloud. Since Cloud Computing leverages many technologies, it also inherits their security issues. Traditional web applications, data hosting, and virtualization have been looked over, but some of the solutions offered are immature or inexistent. We have presented security issues for cloud models: IaaS, PaaS, and SaaS, which vary depending on the model. As described in this paper, storage, virtualization, and networks are the biggest security concerns in Cloud Computing.

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