A Review on Security of Data in Cloud Computing Using Steganography Techniques

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ABSTRACT

With the growth of information on the cloud, cloud security is seen as more essential than before. Currently, millions of users are utilizing the cloud. The security of cloud computing is exigently required, where data are being transmitted or transferred between the users and servers. Steganography is considered as the most effective techniques for securing the communication in the cloud. Steganography refers to writing hidden messages in a way that only the sender and receiver have the ability to safely know and transfer the hidden information in the means of communications. This paper review some of the recent steganography techniques that have been proposed to improve the security of data in the cloud and to make it more immune to cyber-attacks and eavesdropping.

Keywords : Steganography, Cloud Computing, Security, Privacy.

I. INTRODUCTION

As a result of excessive developments in digital technology and network, it has turned out to be extremely well-known and popular to transmit the data from one end to another over web and cloud computing. Cloud computing is a model for allowing advantageous, on-request organize access to a common pool of configurable computing assets (e.g., applications, storage, servers, and networks) that can be immediately provisioned and discharged with minimal management efforts or specialist organization communications (C. Yang, Lin, & Liu, 2013). Hence, a problem of data vulnerability to threat and attack is raised. So, the communication of data should be secure and along with these lines, the significance of information security has been primarily expanded. Information security can be accomplished by utilizing cryptography and steganography methods. Steganography is regularly confused for Cryptography, in spite of the fact that they are truly different terms. Cryptography manages the privacy while steganography manages the secrecy.

The objective of this paper is to review the techniques of steganography that are used with cloud computing to make it more secure and immune to cyber-attacks and eavesdropping.

1.1 CLOUD COMPUTING AND IT'S SECURITY

In the field of Information Technology, Cloud computing is considered as a new paradigm. It is a consequence of developments in distributed computing, systems management, hardware technologies, and Internet technologies (Buyya, Yeo, Venugopal, Broberg, & Brandic, 2009). It is a dynamic technology platform that tends to an extensive variety

of requirements by giving cyber-infrastructure to keep up and broaden data storage abilities. As well as, cloud computing gives access to hardware and software without significant capital speculation and gives simpler access to services and applications that can be acknowledged with insignificant service provider interaction.

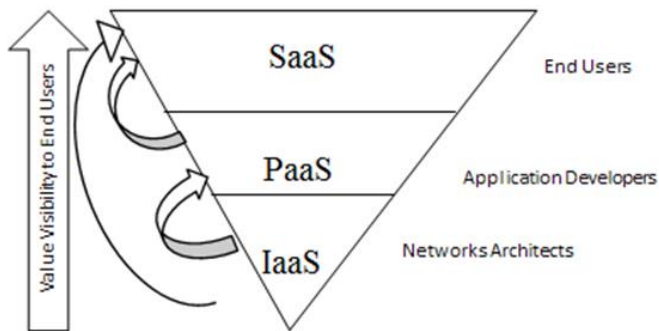Cloud computing researchers have divided cloud computing into three layers

Fig 1. Structure of cloud computing

First: Infrastructure as a Service (IaaS), in this technique the hardware resources such as hard-disk, memory, networking resources etc. are provided on rent and are charged as per the usage. Second, Platform as a Service (PaaS), which not only provides all the facilities as in (IaaS) but also provides operating system facilities, their updates, etc. hence make the overall work quite easy. Third, Software as a Service (SaaS), which is the most flexible and easiest to use. It has all the features of (IaaS) and (PaaS) and moreover provides the freedom to choose software applications from a bundle of already available resources. SaaS includes some processes that enable the service providers to provide application that can be rented on the Internet. Many companies are using and providing these services this include for example Google Apps . Figure1 shows the structure of cloud computing layers.

II. RELATED WORKS

Many research works have been conducted in the literature for securing data in the cloud. In this section, most of the recent steganographic techniques that are implemented to secure the data in the cloud are presented. More specifically, In (Sarkar & Chatterjee, 2014) the authors proposed a viable and effective steganographic technique for upgrading security on data-at-rest. At the point when the data are stored in the cloud data center, nobody can see the first substance of the data with no appropriate identification. Through detailed security and execution investigation, the proposed model nearly guarantees the integrity of data when it is established in the data center of any Cloud Service Provider (CSP). But this technique can deal with just a limited quantity of security threats in a small environment.

In (Saini & Sharma, 2014) the researchers by merging three algorithms enhanced the security of data in cloud computing, initially for authentication and verification of data, Digital signature algorithm (DSA) is applied. Then for data encryption, an Advanced Encryption Standard (AES) algorithm is applied and finally, the last step of this system was to hide data within an audio file using Steganography technique for providing most extreme security to the data. This system fulfills both security and authenticity but because it is a one by one process the time complexity is high.

In (Saravanakumar & Arun, 2014) for providing security to cloud computing, the authors developed an algorithm to develop a client owned security model. This algorithm has the ability for dispatching the encrypted data to the supplier. The supplier can similarly by using the algorithm applies the security by encryption of the client's data. At both the end the client's data is secure. The proposed algorithm together with steganography also uses ASCII and BCD security that stores the encoded data in an image file. Also, they use Common Deployment Model (CDM)

algorithm over the cloud which gives interoperable security services. For the proposed algorithm, the major objective is in an encrypted manner to send and control the data by the client to the supplier. The supplier as well keeps up the data with a security algorithm from unauthorized access the data to be protected.

In (Pant, Prakash, & Asthana, 2015) the authors proposed to use steganography and cryptography technique with each other for securing data. They think that RSA algorithm is the most secured one among other algorithms. For providing more security to data they integrate other algorithms with RSA algorithm. An encrypted image gets it in steganography process, which appears to be identical to the original image by human eye. The differences would be seen If we analysis the image binary codes. Otherwise, the original image can't be recognized. The approach they have used in their paper, for the security of data in cloud computing field or the web it will make a solid structure.

In (Nimmy & Sethumadhavan, 2014) for cloud computing the authors proposed an important verification authentication scheme with many security features such as password change option, session key agreement between the users and the cloud server, and mutual authentication. This proposed scheme with using steganography and secret sharing they presents an innovative way of authentication. Out-of-band authentication gives people communication which makes the protocol better in a way that no supplementary software or hardware or training is needed for the end user. Furthermore, resource constrains of cloud computing are given less urgency to provide high security to the cloud. Many popular attacks can be resisted by the proposed protocol such as man in the middle attack, denial of service attack, and replay attack.

In (Sarvabhatla, M.Giri, & Vorugunti, 2014) the authors have cryptanalysis the "Novel mutual authentication protocol for cloud computing using secret sharing and steganography" proposed by

(Nimmy & Sethumadhavan, 2014). They have demonstrated that this scheme is powerless against different attacks and there is an extension for diminishing the substantial weight of cryptographic operations on resource weaken the client side. They have proposed the enhanced scheme after which, they removed the resource exhausting encryption, decryption, and stegano operations from the client side. With their scheme, the weight on the servers is diminished definitely which brings the faster reaction to clients from the server side. When analyzing security quality of their scheme it shows that it is resistant to all main cryptographic attacks. These two advanced the resistant to all major cryptographic attacks and Less computation requirement from client side makes their scheme further adaptable and practical to usage regardless of resource constrained devices like tabs, mobile etc.

In (Mandai & Bhattacharyya, 2015) they propose a system to address installed classified data in an image similarly of image steganography, however, here an extra technique is utilized to pick pixels of cover image where

the classified data will be hidden. Before hiding the data on the cover image, a technique for privacy encrypts the classified data using Cryptography and GA. They propose a data position scrambling PMM and genetic algorithm based secret key image encryption method. After the proposed technique is investigated, plainly this encryption technique is fulfilled the objectives that are needed in any encryption technique for encrypt content or image.

In (Mohis & Devipriya, 2016) they propose a public key encryption scheme which is a mediated certificate-less encipherment scheme. For the public cloud, it gives unambiguous security. This technique in the public cloud takes care of the key escrow issue and also certificate revocation problem. Notwithstanding this encryption scheme here incorporated an inserting module for upgrading the security. In this method, the sensitive data is hiding

inside an image shared by the organizations, in this way for the attackers the secret data will be hidden. Just the image will be obvious to the unapproved clients subsequently the security can be improved. When different clients are utilizing same arrangements of access control then this technique can perform encipherment only once for each information. Henceforth the general overhead at the proprietor side can be decreased. Implanting module with Steganography decreases unauthorized access of attackers on the sensitive data.

In (Murakami, Hanyu, Zhao, & Kaneda, 2013) the authors proposed a technique for development of security in cloud framework with using of steganography. In the proposed technique, they applied the dynamically generated morphing image for enhancement of security, and this image covers the message which they want to conceal. This is use of steganographic method, and the output is a natural image, so people can't see the image shrouds the message inside. Furthermore, this morphing image is produced dynamically, and for decrypting there is no keys. Other than this method, they characterized a few principles of working condition for development of security.

In (Ke & Dong-qing, 2012) the authors proposed for 3D point cloud models, a new adaptive steganography with high capacity, low robustness and distortion against relative changes and vertex reordering attack. The proposed scheme accomplishes a productive change of implanting imperceptions by utilizing normal direction of vertexes to assess the embedding capacity of each vertex to accomplish adaptability and low distortion, by means of consideration to the human visual system.

In (Ranjan & Bhonsle, 2016) the authors presented new steps for sharing and storing the data in adequately way utilizing multilayer steganography by utilizing AES cryptography alongside information proprietor control to internal or external clients. Presently, clients have much more privacy for storing secret data such as personnel health info, certificate, bank info and so on into the cloud. At the same time, this all stored data will be reachable at any time any location over the globe.

In (Wid A. Awadh & Ali S. Hashim, 2017) the authors proposed a new approach to secure data storage on cloud computing by hide secret English text file in cover English text file by generating a matrix of location.

In (Sreeja Cherillath Sukumaran & Misbahuddin Mohammed 2018) the author proposed a DNA based encryption tech- nique for storing data securely in the cloud especially in the public cloud where data storage is a major concern and for SaaS users where security is a major concern.

In (Osama Hosam ,2019) the author presented an effective and efficient solution to management and distribution problem that always arises in cloud. by utilizing a multitier security solution. Symmetric algorithm AES and asymmetric algorithm ECC is use to ensure secure data storage and sharing. LSB image steganography was used to hide encrypted keys to protect them from malicious users.

In (Denis R & Madhubala P,2020) the author emphasis was made on developing a robust and efficient secure data transmission model. Unlike conventional approaches such as cryptosystems, this research intended to exploit the efficacy of both cryptosystems as well as steganography.

In (Lalit Kumar, Sanjeev Kumar Mandal, Srinivasan S, Omkar Singh, Sabari Giri Murugan ,2021) this proposed approach is a combination of two tested and proven techniques: cryptography and steganography, to achieve a unified data security mechanism. The awareness of spreading this proposed method by uniting a cryptography algorithm with steganography would extant absolute crushed for future research. This is because holomorphic cryptography is endowed with the potential to support computations on encrypted data without the need for prior decryption of such data. This would significantly improve the

confidentiality of both data-at-rest and data-in-transit within the cloud environment.

The summary of all previous literature overview is presented in Table 1.

Table. 1. Using Steganography in Cloud Computing

Authors	year	Title	Used Algorithm
Ke & Dong-qing	2012	"An Adaptive Steganography for 3D Point Cloud Models"	adaptive steganography
Murakami, Hanyu, Zhao, & Kaneda	2013	"Improvement of security in cloud systems based on steganography"	dynamically generated morphing image
Sarkar & Chatterjee	2014	"Enhancing Data Storage Security in Cloud Computing Through Steganography"	
Saini & Sharma	2014	"Triple Security of Data in Cloud Computing"	DSA DES
Saravanakumar & Arun	2014	"An Efficient Ascii-Bcd Based Steganography for Cloud Security Using Common Deployment Model"	ASCII Based SteganoEncryption ASCII Based SteganoDecryption
Nimmy & Sethumadhavan	2014	"Novel mutual authentication protocol for cloud computing using secret sharing and steganography"	secret sharing
Sarvabhatla, M.Giri, & Vorugunti	2014	"A Secure Mutual Authentication Protocol for Cloud Computing using Secret Sharing and Steganography"	secret sharing
Pant, Prakash, & Asthana	2015	"Three Step Data Security Model for Cloud Computing based on RSA and Steganography Techniques"	StegoTools (rRMS) RSA
Mandai & Bhattacharyya	2015	"Secret Data Sharing in Cloud Environment Using Steganography and Encryption Using GA"	PMM (Pixel Mapping Method) GA (Genetic Algorithm)
Mohis & Devipriya	2016	"An improved approach for enhancing public cloud data security through steganographic technique"	mediated certificateless public key encryption

			(mCL-PKE)
Ranjan & Bhonsle	2016	Advanced technics to shared & protect cloud data using multilayer steganography and cryptography	multilayer steganography AES Hash-LSB
Wid A. Awadh & Ali S. Hashim	2017	Using Steganography for Secure Data Storage in Cloud Computing	For Embedding & Extracting
Sreeja Cherillath Sukumaran & Misbahuddin Mohammed	2018	"DNA Cryptography for Secure Data Storage in Cloud"	DNA based Data encryption & Data decryption algorithm
R Shantha kumara & S Malliga	2019	"Dual-layer security of image steganography based on IDEA and LSBG algorithm in the cloud environment	new steganography method with International Data Encryption Standard Algorithm (IDEA) and Least Significant Bit Grouping (LSBG) algorithm for embedding the secret information into an original image and extracting the same
Osama Hosam	2019	"Hybrid Design for Cloud Data Security Using Combination of AES, ECC and LSB-Steganography"	AES, ECC and LSB-Steganography
Denis R & Madhubala P	2020	"Evolutionary Computing Assisted VisuallyImperceptible Hybrid Cryptography and Steganography Model for Secure Data Communication over Cloud Environment"	RSA and AES cryptography algorithms
Lalit Kumar, Sanjeev Kumar Mandal, Srinivasan S, Omkar Singh, Sabari Giri Murugan	2021	"A Secure Communication with One Time Pad Encryption and Steganography Method in cloud	cryptography and stenography technique

III. CONCLUSION

At this point, several techniques proposed by some authors are explored in various literature. Steganography is the latest improvement in addition to a very overstated technique of hiding the data where the cloud is frequently utilized by all clients and their information will keep synchronized to the cloud almost whenever. This steganography technique without using third party interference for data security can be used on networks. So, it can be concluded that there is a difference in complexity of implementation between the reviewed techniques and each of them have its own strong and weak points. Contingent on the necessity of a particular application, for different applications using different steganography techniques.

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