

# A Review on Various Techniques for Encrypting Cloud Data\*

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## ABSTRACT

Cloud computing are new fields having more research work to be done specially in the field of security. Cloud Computing enables various users to send the data over internet which is then stored at data centers, but there is less chance that data is secure and can't be access by the un-authorized users or chances of data loss. Hence Security is an important concern in the cloud computing. Although there are various techniques implemented for the security of cloud data so that it can be access by the un-authorized users and privacy is maintained on user's data. Here in this paper all the techniques that are implemented for security of such cloud data is discussed so that by analyzing the various issues in the techniques a new and efficient technique is implemented in future.

**Keywords :** CVirtual Machines, PAAS, SAAS, K-retrieval, ECC, AES, ECIES, DES.

## 1 INTRODUCTION

Clouds can be explained as pools of virtualized resources that can be easily used and accessed [1]. For optimum resource utilization the resources in cloud can be reconfigured dynamically. With the help of strong cloud architectures its mass computing and storage centers organizations and individuals are benefited while utilizing them. Cloud computing basically contains virtualization, on-demand deployment, Internet delivery of services, open source software etc. [2].

With the help of internet and central remote servers cloud computing maintains data and applications. Cloud Computing provides efficient computing by centralizing storage, memory, processing and bandwidth promising lower costs, rapid scaling, easier maintenance, service availability. The main focus needs upon the data security and privacy. Services provided by cloud computing are [3]:

- Services to large number of distinct end users in opposition to bulk
- Developers are capable of running applications on a separate computing platform with physical infrastructure, job scheduling, user authentication, base software environment etc. and do not need to implement platform by themselves.

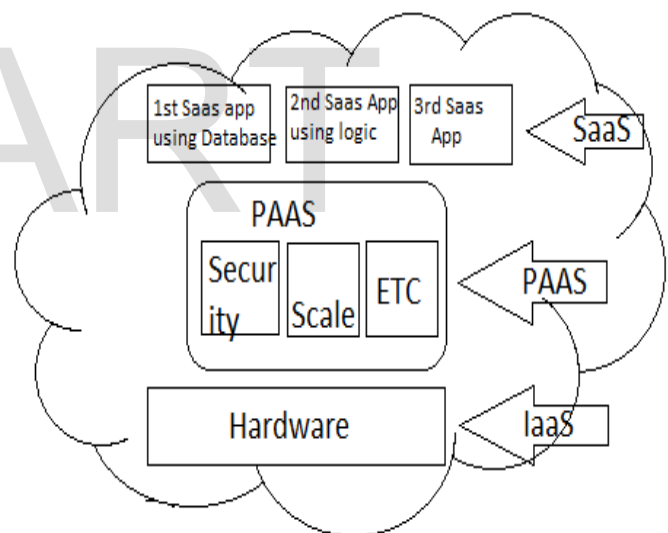


Figure 1.1: Cloud Computing Services

### 1.1 CLOUD SECURITY

Security is an important issue during the transmission of data from sender to receiver whether in wired network or in wireless network or in cloud computing. Cloud Computing provides transmission of data from user to data centre through brokers over internet. Hence security of data is important such that it prevents from various attacks in cloud computing [4].

TPA provides one of the efficient and secure techniques to provide prevention from various attacks. Here public verifiability is needed to ensure the data access from the user is authorized or not [5]. Privacy preserving with public auditing also enables the data to be made secure with homomorphic non-linear authen-

tication and verification [6]. Verifiability of two types private Verifiability and public Verifiability [8].

**1.2 TOP-K RETRIEVAL**

Page ranking is a concept of providing the best retrieval of web pages according to their ranking. The data from various users in cloud computing can be stored in storage panel according to their identities or keywords [10].

With information needs emerging beyond a simple exact match paradigm, databases and information systems have since long catered for extended retrieval paradigms like top-k retrieval or skyline queries. Since the top-k paradigm has been first introduced into the area of database systems a large number of different algorithms have been proposed [11], [12]. Algorithms for top-k retrieval in databases generally try to minimize the number of database objects that have to be accessed before being able to return a correct result set of the k best matching objects. The problem how to define correct retrieval gets even worse, if top-k queries have to be answered. Besides the difficulties with the volatility of the P2P network, also the heterogeneity of the peers plays an important part, since each peer only knows its local objects and different peers may also feature different scoring or retrieval strategies [13].

**1.3 ENCRYPTION TECHNIQUES**

Some amount of data security can be achieved through the encryption of the data.

Some encryption techniques are:

**ECIES:** The Elliptic Curve Integrated Encryption Scheme is a public-key encryption scheme based on ECC. It is designed to be semantically secure in the presence of an adversary capable of launching chosen-plaintext and chosen-cipher text attacks.

The advantage of the ECIES is that on one hand it is meanwhile quite well investigated and thus considered secure while on the other hand just a very short bit length is needed as compared to other asymmetric systems.

**ECC:** Elliptical curve cryptography is a public key encryption technique based on elliptic curve theory that can be used to make faster, less significant and more competent cryptographic keys. ECC produces keys during the properties of the elliptic curve equation as an alternative of the conventional method of creation as the produce of very huge prime numbers. The technology can be used in coincidence with most public key encryption methods, such as RSA, and Diffie-Hellman. According to some examiners, ECC can give way a stage of security with a 164-bit key that other schemes require a 1,024-bit key to accomplish.

**AES:** It is stand for Advanced Encryption Standard. It is a specification of the electronic data encryption. The Advanced Encryption Standard comprises three block ciphers, AES-128, AES-192 and AES-256. AES as a fixed block size of 128 bits and a key size of 128, 192, or 256 bits. The block-size has a maximum of 56 bits, but the key-size has no theoretical maximum. The cipher uses number of encryption rounds which converts plain text to cipher text.

**DES:** It stands for Data encryption standard. It is a widely-used method of data encryption with the help of private or secrete key. DES uses 56-bit key to each 64-bit block of data. It can run in various modes and involves 16 rounds or operations. Although this is considered "strong" encryption, many companies used 'triple

DES' that uses three keys in succession.

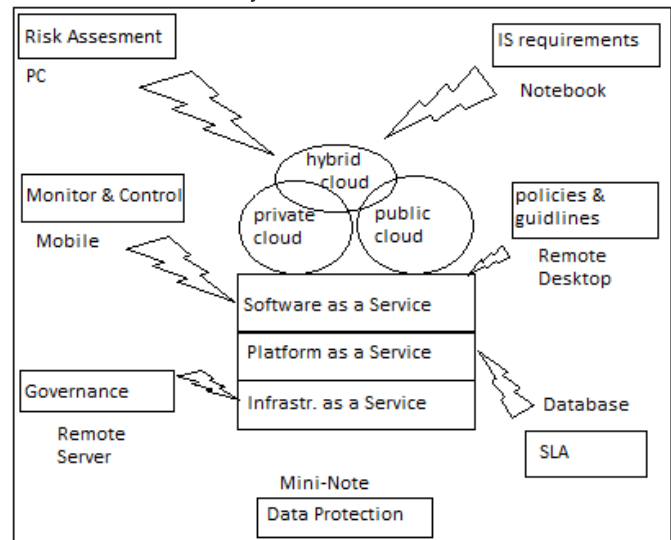


Figure 1.2: Scenario of Retrieval of Encrypted Cloud Data & models [1].

**2 LITERATURE SURVEY**

Some common approaches are also discussed here that work efficiently in field of cloud storage & security, virtualization, multi keyword top-k retrieval, ECIES and other encryption techniques. Jiadi Yu et al [1] uses the concept of multi-keyword retrieval of data from cloud computing. The idea is to encrypt the data based on the keyword of the data and stored in storage panel with their respective encrypted data and keyword. So that when a keyword is search a SSE technique is used to search the keyword and the matched keywords gets the encrypted data and can be decrypted further.

Swathi Sambaing [4] proposed publicly auditable cloud storage providers where data owners can rely on third party auditor to verify the data integrity of sourced data to make sure security.

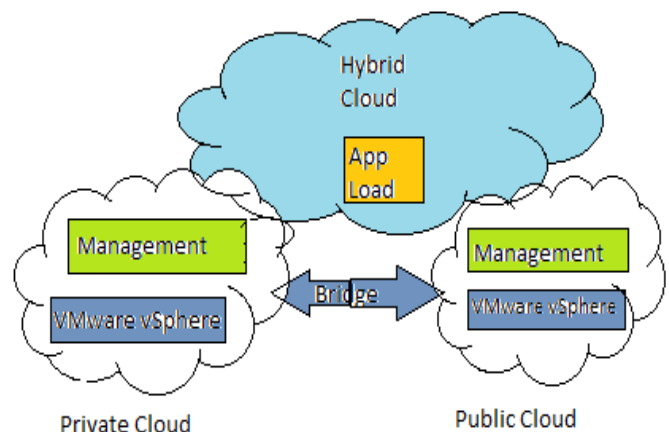


Figure 1.3: Audit system architecture for cloud computing [4].

Q. Wang et al [5] explored the problem of providing

simultaneous public auditability and data dynamics for remote data integrity check in Cloud Computing. In view of the key role of public auditability and data dynamics for cloud data storage they propose an efficient construction for the seamless integration of these two components in the protocol design.

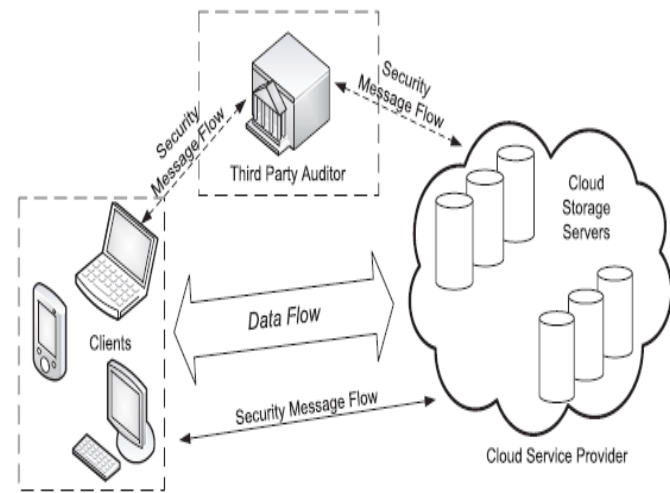


Figure 1.4: Cloud Data Storage Architecture [5].

They [5] assume that TPA is unbiased while the server is untrusted. For application purposes, the clients may interact with the cloud servers via CSP to access or retrieve their pre stored data. More prominently in realistic scenarios, the client may recurrently perform block-level operations on the data files. The most familiar forms of these operations are modification, insertion, and deletion. To effectively support public auditability without having to retrieve the data blocks themselves, they resort to the homomorphic authenticator technique. The naive way of realizing data integrity verification is to make the hashes of the original data blocks as the leaves in MHT, so the data integrity verification can be conducted without tag authentication and signature aggregation steps. So they adopt the block less approach, and authenticate the block tags instead of original data blocks in the verification process. To achieve efficient data dynamics a new and efficient technique is implemented.

Srinivas, D. proposed a new technique in which the burden of cloud user from the tedious and possibly pricey auditing task, but also alleviates the users' terror of their outsourced data security. Taking into account TPA may concurrently handle multiple audit sessions from dissimilar users for their outsourced data files, he further extend this privacy-preserving public auditing protocol into a multi-user scenario, where the TPA can perform multiple auditing tasks in a batch manner for better effectiveness. Extensive examination shows that this scheme is almost certainly secure and highly efficient [6].

Zhu, Yan et al [7] suggested efficient provable data possession for hybrid clouds. They focused on the construction of PDP scheme for hybrid clouds, supporting privacy protection and dynamic scalability. They first provide an effective construction of Cooperative Provable Data Possession (CPDP) using Homomorphic Verifiable Responses (HVR) and Hash Index Hierarchy (HIH). This construction uses homomorphic property, such that

the responses of the client's challenge computed from multiple CSPs can be combined into a single response as the final result of hybrid clouds. By using this mechanism, the clients can be convinced of data possession without knowing what machines or in which geographical locations their files reside. More prominently a new hash index hierarchy is proposed for the clients to seamlessly store and manage the resources in hybrid clouds. Their experimental results also validate the effectiveness of their construction.

In 2009 Qian Wang et al [8] introduced a new scheme which gives remote data integrity and verifiability means dynamic data operations. The method initially identifies the troubles and potential security problems of direct extensions with fully dynamic data updates. It achieves efficient data dynamics and improves the Retrieve ability model by manipulating the classic Merkle Hash Tree (MHT) construction used for block tag validation. It is extremely proficient and secure technique [8]. Michael Armbrust et al [9] presented a survey on cloud computing. They defined basic terminology of cloud. They also compare cloud with other related technologies. They also try to identifying the top technical and non-technical obstacles and opportunities of cloud computing. Virtualization is primary security mechanism of cloud computing. Multiple virtual machines (VMs) can share CPUs and main memory surprisingly well in cloud computing. Virtualization is essential to improve architectures and operating systems to efficiently virtualized interrupts and I/O channels [9].

The problem of effective yet secure ranked keyword search over encrypted cloud data is solved by Cong Wang et al [14]. Ranked search greatly enhances system usability by returning the matching files in a ranked order regarding to certain relevance criteria, thus making one step closer towards practical deployment of privacy-preserving data hosting services in Cloud Computing. They primarily given a straightforward yet ideal construction of ranked keyword search under the state-of-the-art searchable symmetric encryption (SSE) security definition, and demonstrate its inefficiency. To accomplish more practical performance, then they suggested a definition for ranked searchable symmetric encryption, and given an efficient design by properly utilizing the existing cryptographic primitive, order-preserving symmetric encryption (OPSE). Thorough analysis shows that this solution enjoys "as-strong-as-possible" security guarantee compared to previous SSE schemes, while correctly realizing the goal of ranked keyword search. Extensive experimental results demonstrate the efficiency of the proposed solution [14].

Cong Wang et al [15] recommended a secure cloud storage system supporting privacy-preserving public auditing. This is among the first few ones to support privacy-preserving public auditing in cloud computing, with a focus on data storage. Besides, with the prevalence of cloud computing, a foreseeable increase of auditing tasks from different users may be delegated to TPA. Their preliminary experiment conducted on Amazon EC2 instance further demonstrates the fast performance of their design on both the cloud and the auditor side. They leaved the full-fledged implementation of the mechanism on commercial public cloud as an important future extension that is expected to robustly cope with very large scale data and thus encourage users to adopt cloud storage services more confidently [15].

Ning Caoy et al [16] define and solve the problem of multi-keyword ranked search over encrypted cloud data (MRSE)

while preserving strict system-wise privacy in the cloud computing paradigm. To meet the challenge of supporting such multi-keyword semantic without privacy breaches, they suggested a basic idea for the MRSE using secure inner product computation, which is adapted from a secure k-nearest neighbor (kNN) technique [17], and then give two significantly improved MRSE schemes in a step-by-step manner to achieve various stringent privacy requirements in two threat models with increased attack capabilities.

They [16] defined the framework of multi-keyword ranked search over encrypted cloud data (MRSE) and establish various strict system-wise privacy requirements for such a secure cloud data utilization system. For easy presentation, operations on the data documents are not shown in the framework since the data owner could easily employ the traditional symmetric key cryptography to encrypt and then outsource data. The representative privacy guarantee in the related literature, such as searchable encryption, is that the server should learn nothing but search results. With this general privacy description, they explored and established a set of strict privacy requirements specifically for the MRSE framework.

Hussain Abo Surrah aimed to provide searching a file over cloud environment using multiple keywords representing the file with various probable situations [18]. The target is to provide the security to its maximum extent by including encryption and decryption methods. Authorization of the users directly by the administrators allows the files involved to transfer more securely. Encryption and decryption of both file name and file which uses asymmetric and symmetric key algorithms respectively. The secret key is generated for each user to prevent any other user to misuse the file. The data that are stored in the cloud has to be protected completely from any attack that is caused both by external and internal attackers. Most of the internal attacks are used by the cloud providers by using similarity relevance and analyzing the statistical leakage. Based on the usage of the file over ranked manner, it is easy to get all the details of the most used files through probability prediction. This kind of data leakage should be completely avoided and maximum protection to the data is given. The solution suggests the same by applying some new concepts to increase the data security [18].

### 3 CONCLUSION

Security in cloud computing is an important field area where various techniques are implemented. The paper discusses and analyzed various security techniques implemented in cloud computing environment for the prevention from various attacks. The survey of such techniques is described and analyzed here so that on the basis of their issues and limitations a new and efficient technique is implemented in future.

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