A SYMMETRIC-KEY APPROACH TO VERIFIED KEYWORD SEARCH IN DYNAMIC ENCRYPTED CLOUD DATA

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ABSTRACT

This paper presents a novel symmetric-key based verification mechanism for conducting secure keyword searches over dynamic encrypted cloud data. As organizations increasingly rely on cloud storage for sensitive information, the need for efficient and secure retrieval methods becomes paramount. Traditional encryption techniques often limit the ability to search through encrypted data, resulting in inefficiencies and potential security risks. Our proposed framework addresses these challenges by enabling users to perform keyword searches while ensuring data confidentiality and integrity through symmetric-key encryption. Additionally, the system supports dynamic updates to the dataset, allowing for real-time modifications without compromising security. Preliminary evaluations demonstrate the effectiveness of our approach in enhancing search efficiency and maintaining robust security, highlighting its applicability in various cloud environments. This research contributes to the ongoing efforts to balance usability and security in cloud-based data management.

KEYWORDS: *cloud computing, encryption*

I. INTRODUCTION

The rapid adoption of cloud computing has revolutionized the way organizations store and manage data, offering significant advantages such as scalability, cost efficiency, and accessibility. However, as more sensitive information is migrated to the cloud, concerns regarding data security and privacy have intensified. Traditional methods of protecting data, such as encryption, play a crucial role in safeguarding sensitive information from unauthorized access. Nevertheless, standard encryption techniques often render data non-searchable, creating a challenge for users who require efficient retrieval of specific information.

To address this issue, there is a growing need for secure keyword search mechanisms that allow users to perform searches over encrypted data without compromising confidentiality. Keyword search functionality is vital in numerous applications, including document management systems, healthcare data retrieval, and corporate information systems. Without effective solutions, users face the burden of decrypting entire datasets to find relevant information, which is both time-consuming and inefficient.

This study proposes a symmetric-key based verification mechanism designed to facilitate keyword searches over dynamic encrypted cloud data. By utilizing symmetric-key encryption, we ensure that data remains secure while allowing authorized users to search for specific keywords efficiently. Our approach not only maintains the confidentiality and integrity of the data but also supports dynamic updates, enabling users to modify the dataset without compromising security.

The objectives of this research are twofold: to develop a robust framework that enables efficient keyword searches on encrypted data and to implement a verification mechanism that ensures only authorized users can access and perform searches. This paper outlines the design, implementation, and evaluation of the proposed system, aiming to contribute to the ongoing efforts to enhance security and usability in cloud environments. Through this research, we seek to demonstrate that it is possible to achieve a balance between data security and efficient information retrieval in the context of encrypted cloud storage.

LITERATURE SURVEY

The challenge of performing keyword searches on encrypted data has garnered significant attention in recent years, as researchers strive to enhance data security while maintaining search functionality. Early works in this field primarily focused on searchable symmetric encryption (SSE), which enables users to search over encrypted data without requiring decryption. Curtmola et al. (2006) introduced foundational concepts in SSE, demonstrating that it is possible to perform keyword searches efficiently while preserving data confidentiality. Their work laid the groundwork for subsequent research, which sought to improve the efficiency and security of these methods.

In recent years, various enhancements to SSE have emerged. For instance, Zhang et al. (2018) proposed a dynamic searchable encryption scheme that supports updates to the encrypted dataset, addressing a critical limitation of earlier SSE models that only allowed static data. This advancement is crucial for real-world applications where data is frequently modified. Other studies have explored hybrid encryption approaches that combine symmetric and asymmetric encryption techniques to optimize search performance while ensuring strong security guarantees (Wang et al., 2020).

A significant aspect of secure keyword searching is the integration of verification mechanisms to prevent unauthorized access. Wang et al. (2021) examined the role of verification in keyword search frameworks, proposing a method that authenticates users before allowing access to search functionalities. Their approach enhances security by ensuring that only legitimate users can perform searches on the encrypted data, thereby mitigating risks associated with data breaches.

Despite these advancements, challenges remain. Issues such as scalability, efficiency, and user-friendly interfaces need further exploration to ensure that these systems can be widely adopted. Additionally, ensuring the privacy and integrity of data during both the search process and subsequent updates is paramount. Recent literature emphasizes the importance of developing solutions that not only address security concerns but also maintain usability and performance in dynamic environments.

In summary, the literature highlights significant progress in the area of keyword searching over encrypted data, particularly with the introduction of dynamic searchable encryption and verification mechanisms. However, further research is necessary to refine these approaches, ensuring they can effectively meet the demands of modern cloud computing environments while balancing security and usability. This study aims to build on these foundational works by proposing a symmetric-key based verification mechanism that facilitates efficient keyword searches in dynamic encrypted cloud data**.**

II. PROBLEM STATEMENT

- In the current work, the system leaks a lot of data for updates and can't be parallelized.

- Several forward-private DSSE systems that are both asymptotically complicated and performant in practise have been suggested..

III. EXISTING SYSTEM

Firstly, users may worry about whether their data is intactly stored in the cloud because the cloud data is out of their physical control. In order to solve this problem, some cloud storage auditing schemes are proposed to check the integrity of cloud data. In addition, users usually need to encrypt the data for keeping the privacy before outsource them to the cloud. It makes performing keyword search over encrypted cloud data become a new challenge. In order to address this issue, searchable encryption is proposed, which allows users to selectively retrieve cipher documents stored in the cloud by keyword-based search. Compared with searchable public key encryption, searchable symmetric encryption draws more attention owing to its high efficiency.

Static SSE. Song et al firstly proposed the searchable symmetric encryption scheme, in which a special two-layered encryption structure is constructed to encrypt each keyword. Goh et al proposed a keyword search scheme over encrypted cloud data based on the Bloom filter. Curtmola et al proposed two efficient keyword search schemes (SSE- 1 and SSE-2) over encrypted cloud data. These schemes can realize sub linear search, that is, the search cost is proportional to the number of the files matching the queried keyword. Cao et al. proposed a privacy-preserving multi-keyword ranked search scheme over encrypted cloud data by utilizing the similarity measure of “Coordinate matching” and “inner product similarity”. In addition, some other static SSE schemes, such as semantic search scheme, similarity search scheme, ranked keyword search schemes, central keyword-based semantic extension search scheme, and keyword search scheme supporting deduplication, have also been proposed.

Dynamic SSE. In order to support data dynamic update, some dynamic SSE schemes have been proposed. Kamara et al. proposed a dynamic SSE scheme by extending the inverted index approach. This scheme can achieve sublinear search and CKA2-security. Subsequently, they proposed another dynamic SSE scheme based on keyword red-black tree index structure. This scheme supports parallel keyword search as well as parallel addition and deletion of files. Naveed et al. presented a dynamic SSE scheme via blind storage. Blind storage allows a data owner to store files on a cloud server in such a way that the cloud server does not learn the number of files. Xia et al. proposed a dynamic keyword search scheme over encrypted cloud data based on the tree-based index structure, which can support multi-keyword rank. Guo et al. proposed a dynamic SSE scheme based on the inverted index. It enables the data user to search several phrases in a query request. Also, their proposed scheme supports the sorting of the search results.

IV. PROPOSED SYSTEM

We develop a unique symmetric-key based Accumulative Authentication Tag (AAT) to produce an authentication tag for each keyword in order to allow the effective verification of dynamic data. The accumulation feature of our built AAT enables the authentication tag to be easily updated whenever dynamic operations on cloud data take place. The suggested AAT is computationally challenging for any attacker to discover various messages with the same tag since it is collision resistant. Additionally, it has the ability to withstand replay attacks, which stop the cloud server from delivering outdated data. We create a new secure index made up of a search table ST and a verification list VL to achieve effective data updating. ST is based on the orthogonal list and VL is a singly linked list. For each keyword, we construct a linked list with the same length aiming at hiding the frequency of each keyword. When performing modification operations, the cloud server can fleetly find the index nodes related to the modified files. When some files need to be added or deleted, the secure index can be conveniently enlarged or reduced. Owing to the connectivity and flexibility of ST, the update efficiency can be significantly improved. Based on the above technique and structure, we design the first keyword search scheme over dynamic encrypted cloud data with symmetric-key based verification. We give the security analysis of the proposed scheme and conduct the performance comparison with other work in terms of the search token generation efficiency, verification efficiency and update efficiency. The results show that the proposed scheme is secure and efficient.

V. MODULES

Data Owner

In this module, the data provider uploads their encrypted data in the Cloud server. For the security purpose the data owner encrypts the data file and then store in the server. The Data owner can have capable of manipulating the encrypted data file and performs the following operations Browse and enc and Uploads files, View all your uploaded files, Verify your secret key, Verify your file, View all search and pkey request.

- **Cloud Server**

The Cloud server manages which is to provide data storage service for the Data Owners. Data owners encrypt their data files and store them in the Server for sharing with data consumers. To access the shared data files, data consumers download encrypted data files of their interest from the Server and then Server will decrypt them. The server will generate the aggregate key if the end user requests for file authorization to access and performs the following operations such as View all cloud files ,Capture all attackers, View all attackers, View all key attackers, View all transactions, View all search requests, View File Rank Result, View Time Delay Results, View Throughput Results

- **END User**

In this module, the user can only access the data file with the secret key. The user can search the file for a specified keyword. The data which matches for a particular keyword will be indexed in the cloud server and then response to the end user and can do the following operations like Register and Login, Request File Search and pkey and View Response, Search Files by Multi keyword, Download File.

VI. METHDOLOGY

In algorithm **IndexBuild**, the data owner builds the secure index I = (ST, VL). In ST, each row list Lwi ($1 \le i \le n$) is associated with one keyword wi . The head node of each row list stores the keyword permutation π(wi) as the address of this list. All head nodes are linked to the first column list Lf0 , which are used as look-up nodes for cloud server. The index node of each row list stores the ciphertext Ewij = SKE.EncKwi (wij , vj) ($1 \le j \le N$) related to an index vector bit wij and the update times vj . All index nodes in the same column are linked to the column list Lfj , which corresponds to the file Fj . For each keyword wi , the authentication tag AATSi stored in the index node of VL is computed based on the accumulation property of AAT. When the data user would like to search files containing the interested keyword, he generates the trapdoor through algorithm GenToken. The cloud server can perform search operation through algorithm

Search. In algorithm Verify, the data user computes the authentication tag for returned cipher texts, and checks whether these cipher texts are correct according to the authentication tag. In algorithm **UpToken**, the data owner generates update tokens for the updated files. Each token is composed by n + 2 elements. The first element denotes the identifier of the updated file and the last element denotes the cipher text of the updated file. Each middle element includes the values of updated index nodes in ST and the update value of AAT in VL. Owing to the connectivity and the flexibility of orthogonal list, the cloud server can update the secure index efficiently in algorithm Update. In modify operation, the cloud server replaces the value of each index node related to the updated file with the new one in ST and updates AAT value in VL according to the update value. In add operation, the cloud server adds a new column list in ST and updates AAT value in VL according to the update value. In delete operation, the column list related to this file in ST is deleted directly. The cloud server only needs to update AAT value in VL. Owing to the accumulation and the update property of AAT, the values of index nodes in VL can be conveniently updated.

VII. RESULTS SCREENSHOTS

If you're seeing this, you've successfully installed Tomcat. Congratulations!

Fig 7.1: tomcat server

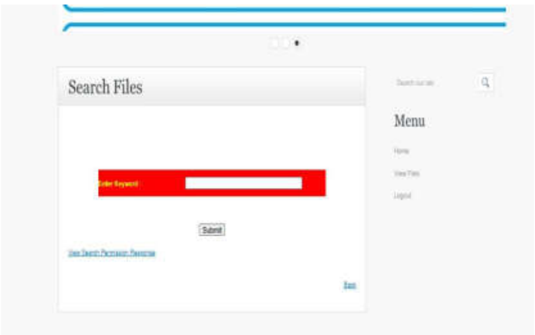
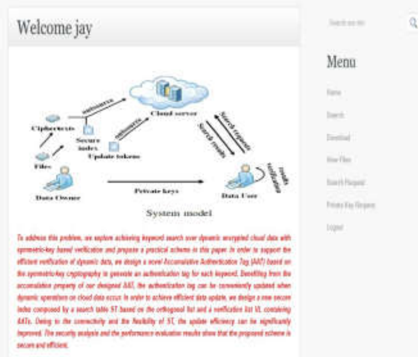


Fig7.2:filesearchbox

Towards Achieving Keyword Search over Dynamic Encrypted Cloud Data with Symmetric-Key Based Verification

Fig 7.3: various users



To address this problem, we explore achieving keyword search over dynamic encrypted cloud data with symmetric-key based verification and propose a practical scheme in this paper. In order to support the efficient verification of dynamic data, we design a novel Accumulative Authentication Tag (AAT) based on the symmetric-key cryptography to generate an authentication tag for each keyword. Benefiting from the accumulation property of our designed AAT, the authentication tag can be conveniently updated when dynamic operations on cloud data occur. In order to achieve efficient data update, we design a new secure index composed by a search table ST based on the orthogonal list and a verification list VL containing AATs. Owing to the connectivity and the flexibility of ST, the update efficiency can be significantly improved. The security analysis and the performance evaluation results show that the proposed scheme is secure and efficient.

Fig7.4:userloginpage

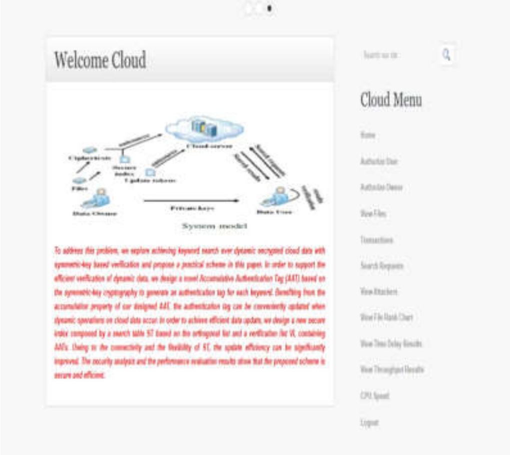


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Fig 7.5: cloud login

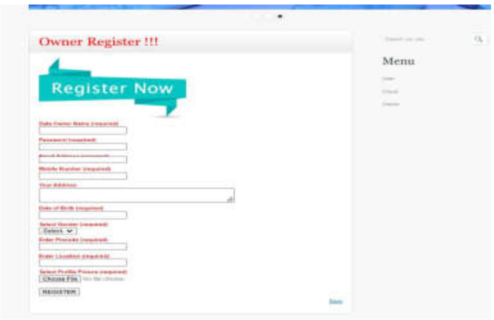
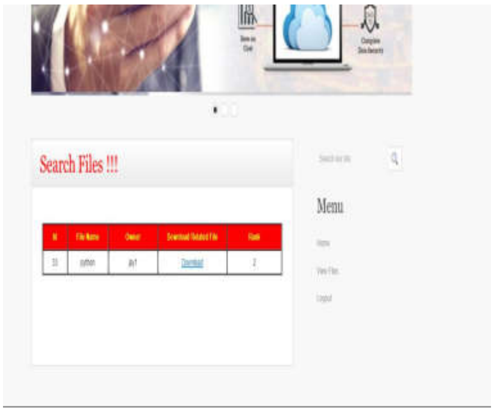


Fig 7.6: owner registration



Id	File Name	Owner	Download Related File	Rank
33	python	[illegible]	Download	2

Fig 7.7: search files

HOME
USER
OWNER
CLOUD
Fuzzy Identity-Based Data Integrity Auditing for Reliable Cloud Storage Systems
Introduction
System model
Home Menu
Concepts

Fig 7.8: login page

CONCLUSION

In conclusion, the proposed symmetric-key based verification mechanism for keyword searches over dynamic encrypted cloud data represents a significant advancement in the quest for secure and efficient data retrieval. By enabling users to conduct keyword searches while preserving the confidentiality and integrity of their data, our framework addresses key limitations of traditional encryption methods. The integration of dynamic updates further enhances its applicability in real-world scenarios, allowing for seamless modifications without compromising security. Preliminary evaluations indicate that our approach not only improves search efficiency but also maintains robust security standards, making it a valuable contribution to the field of cloud computing. As data security remains a critical concern for organizations, this research lays the groundwork for future exploration into optimizing keyword search mechanisms and enhancing user accessibility in secure cloud environments. Continued development in this area will be essential for fostering greater trust and adoption of cloud technologies in managing sensitive information.

FUTURE SCOPE

As technology develops, so do the methods we employ to promote and improve our websites. Using the appropriate keywords in your content to assist search engines identify and rank your website was the main focus of keyword search in the past. This is beginning to change, though, as machine learning and artificial intelligence (AI) become more prevalent. AI can also be utilised to give users more individualised experiences. If you run a shopping website, for instance, AI can be used to suggest things based on what a customer has previously viewed. Sales and conversion rates can both rise with the help of this personalisation. Machine learning and AI will continue to play a bigger role in search engine optimisation as they develop. Based on our search history and preferences, we'll receive more customised results and recommendations. Additionally, a lot of data may be analysed using machine learning to find new trends and business prospects.

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