

# **A Survey on Privacy Preserving Ranked Multi-Keyword Search for Multiple Data Owners over Encrypted Cloud Data**

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**ABSTRACT:** with the advent of cloud computing, it has turned out to be progressively prevalent for data owners to outsource their information to open cloud servers while permitting information clients to recover this information. For protection concerns, secure ventures over encrypted cloud information have motivated a few research works under the single owner model. In any case, most cloud servers in practice don't simply serve one owner; rather, they support various owners to share the advantages brought by distributed computing. Hence these data owners can upload their files over the cloud so that the different data users could find various files and use them.

**KEYWORDS:** Cloud computing, Multi-keyword, Ranked search, Multiple data owner.

## **I. INTRODUCTION**

In today's world, the sharing of data is a vital part of our lives. The data can be sensitive and hence when it gets into the hands of wrong people, it can turn out to be harmful for both the owners and the receivers. Hence to overcome such a situation, encryption and decryption of data can be done for the safe exchange of any amount and type of data. There are two sets of parties which would use this technique; one being the data owners, which would own the data and the next are the data users which do not own the data but use this after getting the permission for the usage. The data owners and the data users need to be authenticated on the cloud servers before hand to use any of the services provided. When the sensitive data is outsourced to the cloud, so as to enable the easier accessing of the data by the data owners and the data users, it is encrypted. The data encrypted has a list of keywords which are sent to an administration server. This in turn is then re-encrypted and uploaded by the administration server. When the data users would want to access these encrypted files, they will have to get themselves authenticated. Once the data users are authenticated and verified, they would search the files using keywords. The keywords are sent to the administration server which in turn would encrypt the given keyword. The encrypted keyword is then compared to the existing keywords and the files are given to the data users after the decryption. Hence this helps in creating a secure environment for the exchange of the information among the data owners and the data users.

### **A. Multi-Keyword**

Multi-keyword refers to the ability of searching multiple keywords at a given time. This means that the user can search n number of keywords at a given time. The file retrieved is the one which either contains all the keywords or a minimum of one of the keyword that the user searches.

### **B. Ranked Search**

As the user searches for the document over the cloud, like Google, the cloud server can return the document which is the most relevant document amongst the entire collection of document. The search result can be ranked on different parameters. The parameters can be last downloaded, last visited, recently uploaded, etc. when the user tries to access a document, he/she can specify the k number of documents to be downloaded. When the k is specified, the top k documents are downloaded. This saves a round trip of requests, bandwidth; as only specified numbers of documents are downloaded and the computation time is reduced.

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## C. Multiple Data Owners

The data owners are the types of users which upload their data over the cloud server. The data owners register themselves at the administrators and hence this gives them the right to upload their data. The data users hence use this data for their future uses.

## II. MOTIVATION

As the cloud computing is prevalent in today's world, the storage of data over cloud has become very common. As the data over any device is insecure, it is stored in an encrypted format which when needed has to be decrypted. Another issue related to this is the availability of the data to the users who should be authorized. The data owners are the set of users which upload their sensitive data over the cloud and the data users are the set of users which use the data which is uploaded over the cloud. This means that the data users make use of the data that is stored by the data owners. To do so, the data users should be able to search the data that is uploaded. As this is in the encrypted format, it would be very difficult for the data users to understand so as to which file is needed and which is not. Also the top ranked file would be required to be used as they would be the recent ones and hence would be more important than those which are rarely used.

## III. LITERATURE SURVEY

Michael Armbrust et al [2] explain about the various advantages and uses of the cloud storage. It helps in a large amount of storage space without the use of the resources in the real time. The resources used to carry out storage operations are never owned by the users and hence the users have to pay per use. This strategy helps in eco friendly and green computing as well. This is possible as the resources that were used earlier for the storage, such as the servers, systems, space, cooling systems and many more are no longer required. The storage systems are virtually present for the user and logically present in a different location. The paper also discusses about the different service models; namely, Infrastructure as a service, Platform as a service and Software as a service. It also discusses the different type of clouds such as public cloud, private cloud, hybrid cloud and the community cloud.

Dawn Xiaodong Song et al [3] discusses about the four of the most important concepts of provable security, query isolation, controlled searching and hidden query. The provable security helps in keeping the data secure. This is done as the untrusted server cannot understand about the plaintext from the encrypted text that is uploaded. The query isolation also helps in maintaining the secrecy.

The untrusted server will be unable to learn anything about the plaintext present in the file through the encrypted data about which it is queried. The controlled searching explains that the untrusted server will be unable to search any query or a keyword without the authentication of the users which are already registered. The hidden query talks about the keyword or the query that is being searched. This is in a non-readable form and therefore the untrusted server does not know what the user is searching. Hence the untrusted server will never be able to guess or hack into the system and retrieve any file saved.

Cong Wang et al [4] discusses over the drawbacks of the traditional cloud file retrieval system. There are majorly two drawbacks of this system. The user when tries to retrieve a file from the cloud, the user has to download all the files that are related to the keyword or the query that the user has entered. This leads to a huge consumption of the bandwidth. As the user has downloaded a large number of files, user has to decrypt each file in order to understand whether the file is required or not. The file that is retrieved can be either useful to the user or can be an older file which has not much significance.

Therefore, the authors put forward an idea about ranking of the files and documents that are saved over the cloud. This would help in retrieving the files which are recent or most downloaded. The paper also discusses the shortcomings of the Searchable Symmetric Encryption (SSE).

Jin Li et al [5] discusses about the fuzzy keywords that might occur during a search. Fuzzy keywords are the words which are spelled wrong and are entered into the query box. They can be done using the simple spell checking. These kinds of words should be given suggestion and have to show results which might be possibly near the word. For example, if a query is made for Lonfon, the fuzzy keyword correction should show any data that might contain Lonfon

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or London as it is the nearest word which might be correct. It may also consider every possible keyword. This might include \*Lonfon, L\*onfon, etc.

Qin Liu et al [6] discusses about the ADL. The aggregation and distribution layer (ADL) is a middleware layer between the users and the cloud. It was envisioned such that an ADL will be deployed in an organization that has outsourced the data operations to a cloud. The ADL will aggregate queries from multiple users and send a combined query to the cloud. Due to this combined query, the cloud will need to execute the query only once and return all matched files to the ADL. Furthermore, since the files of most interest to the users need to be returned only once, the communication costs will also be reduced.

Furthermore, the authors have discussed over the Efficient Information retrieval for Ranked Query (EIRQ). The EIRQ helps in the retrieval of the files which are the top k specified. The user has to define the value of the k percentage of the files that are required by the user. This will help in lowering the overhead communication cost and hence the computations required will be less. This would save a round trip time and hence would give better and faster results.

The author Hongwei Li et al [7] describes the arrangement of a model which involves a single data owner, multiple data users and a single cloud server. This model is very similar to the multi-owner multiple data users model. As the data owner is single, the key used to encrypt the files is same.

This method of uploading the files is a disadvantage. If there is a leakage of key, the cloud server along with the other users will be able to retrieve the files that are stored in the cloud server. If this happens, a lot of sensitive information can be compromised.

Wei Zhang et al [8] discusses about extending the existed single-owner scheme to a full-fledged multi-owner scheme will cause abundant problems. In the single-owner scheme, once a data user wants to issue a keyword search, he has to ask the data owner for secret keys to generate trapdoors (encrypted keywords). Unfortunately, when there are multiple data owners, asking different data owners for keys to generate trapdoors would be infeasible.

First, not all data owners are always online simultaneously when a data user wants to perform a query. If data owners are offline, these owners' data can't be retrieved in time. Second, in order to search different owners' data, data user has to generate a specific trapdoor for each data owner, sending these trapdoors to the cloud server would cause considerable communication overhead. An alternative solution is to share a secret key among all data owners. However, this measure will lead to the security threat of single point of failure.

## IV. EXISTING SYSTEM

The author Wei Zhang et al [1] describes a system which helps in data retrieval from the cloud. As the data can be sensitive and hence when it gets into the hands of wrong people, it can turn out to be harmful for both the owners and the receivers. Hence to overcome such a situation, encryption and decryption of data can be done for the safe exchange of any amount and type of data. There are two sets of parties which would use this technique; one being the data owners, which would own the data and the next are the data users which do not own the data but use this after getting the permission for the usage. The data owners and the data users need to be authenticated on the cloud servers before hand to use any of the services provided. When the sensitive data is outsourced to the cloud, so as to enable the easier accessing of the data by the data owners and the data users, it is encrypted. The data encrypted has a list of keywords which are sent to an administration server. This in turn is then re-encrypted and uploaded by the administration server.

When the data users would want to access these encrypted files, they will have to get themselves authenticated. Once the data users are authenticated and verified, they would search the files using keywords. The keywords are sent to the administration server which in turn would encrypt the given keyword. The encrypted keyword is then compared to the existing keywords and the files are given to the data users after the decryption. Hence this helps in creating a secure environment for the exchange of the information among the data owners and the data users.

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## V. SYSTEM ARCHITECTURE

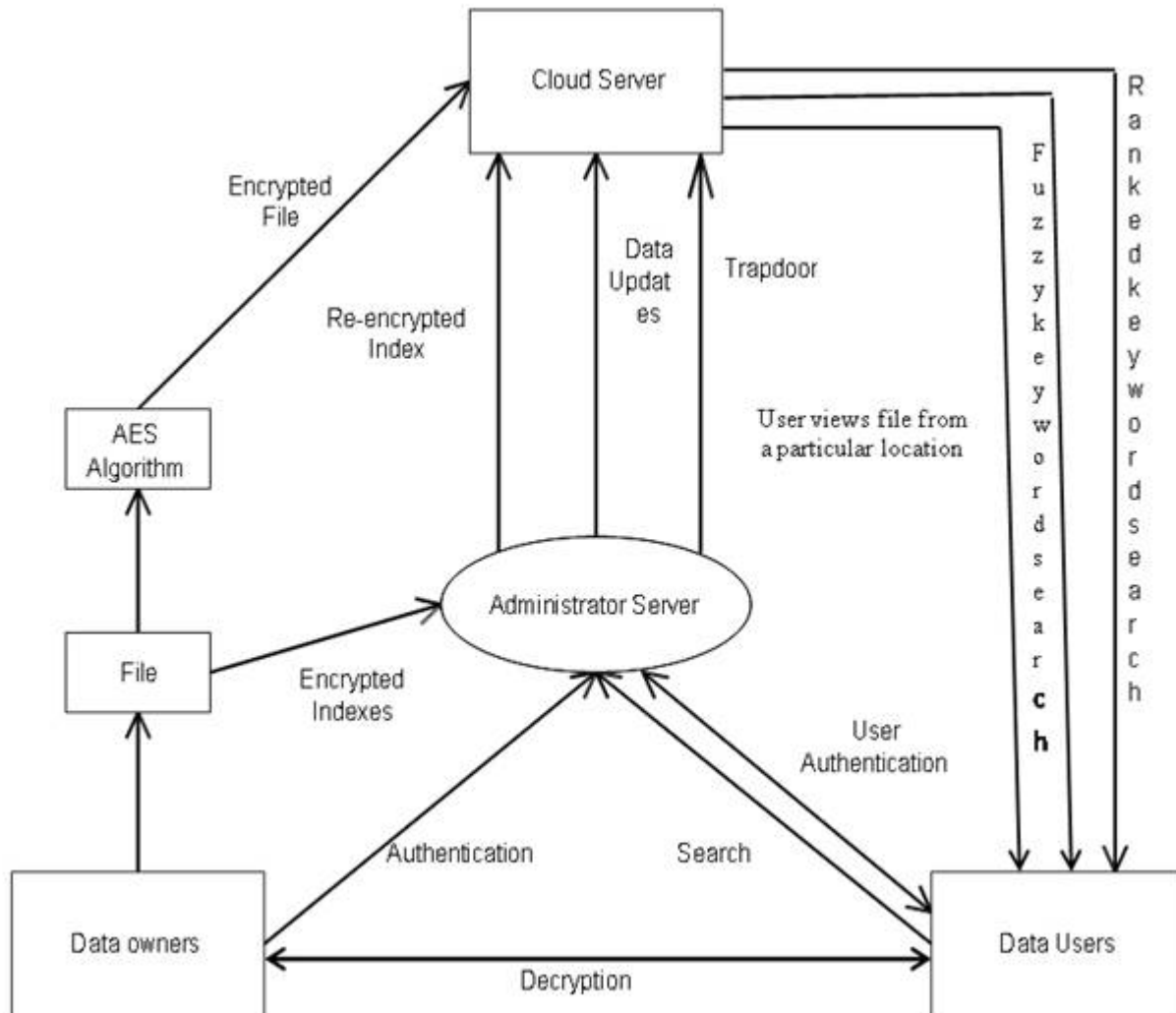


Fig. 1 : System architecture

The system consists of four components: the data user, data owner, administrator and the cloud server. The data owners are the group of users which own the data and upload their data over the cloud server. The data users are the users which try to access the uploaded data. The administrator acts as a mediator between the data owner or data user and the cloud server. The cloud server is the huge collection of data which is made available for all the data owners to upload files and documents and also for the data users for the successful retrieval of the data.

The data users and data owners have to authenticate beforehand. This will help in preventing any unauthorized trespassing. The administrator maintains a system for publishing the trapdoor whenever the data user asks for a specific file or folder. The trapdoor is the encrypted keyword which is to be searched over the cloud server. Once this is sent, it will help in safe retrieval of the documents without the cloud server getting to know about the plaintext.

After the files are found, the cloud server sends the encrypted files to the respective data user. The data user will have to decrypt the file with a key and access the contents in it.

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## VI. CONCLUSION

A thorough analysis of different methods of storing data, the formation of the dictionary, maintenance of the dictionary, the ranking of the files that are to be retrieved, the number of files to be retrieved was done. The above mentioned methods have helped in a better understanding. A secure method of retrieving data from cloud would help the users to trust the cloud services, as it is not very widely used due to a misconception of lack security. As more and more data would be saved over the cloud, the data can be retrieved at any given point in time and place.

## VII. FUTURE WORK

The data that is stored over the cloud is encrypted. The encryption of the data has helped in providing a secure method of storage of data. As the data is being stored over the cloud, the it can be accessed by the other authenticated members of the system. The future work can hold the solution to the fuzzy keyword searching mechanism. This would in turn help in searching for a document which might be near the keyword that is searched. This would reduce the turnaround time of the query as the results of keywords which might be possible will also be listed.

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