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A Novel Approach for Access Control and Security in Cloud Computing

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Abstract : The utilization of cloud storage services offers significant benefits in terms of convenient data sharing and cost reduction. However, this approach to data storage presents challenges in terms of protecting data confidentiality. As data are no longer solely within the domain of the data owner, they cannot entirely trust the cloud server to securely manage data access control. As a result, the problem of secure access control has become a challenging issue in cloud storage. Cloud-based data storage has significant benefits, such as convenient data sharing and cost reduction. However, this new storage paradigm has introduced challenges in protecting data confidentiality. Data is no longer solely under the control of the data owner and the cloud server cannot always be trusted to maintain secure data access control. Therefore, secure access control has become a challenging issue in cloud storage.

IndexTerms **- Data storage, cloud storage, data confidentiality, secure data access control.**

I. INTRODUCTION

Numerous works have been done on privacy-preserving data sharing in the cloud, utilizing various cryptographic primitives. Among these schemes, those based on CP-ABE have attracted extensive attention due to their ability to provide data owners with fine-grained and flexible access control of their own data. However, these schemes only consider a user's inherent attributes in determining their access privileges, without considering other important aspects such as the time factor. Time-sensitive data, such as the latest electronic magazine or a company's future business plan, requires access to be granted at specific times. Current CP-ABE based schemes cannot meet this requirement. To address this issue, an effective scheme is needed that does not release data access privileges until the corresponding predefined time. Manually releasing time-sensitive data, as a trivial solution, requires data owners to repeatedly upload different encryption versions of the same data and restricts them to be online at all times. This paper aims to implement an efficient time and attribute factors combined access control scheme for time-sensitive data in the public cloud to process secure and time-sensitive data effectively. The proposed scheme inherits the fine granularity property of CP-ABE and introduces the trapdoor mechanism. The proposed approach in this paper introduces a trapdoor mechanism that is exclusively linked to the time factor. This means that only one secret is required to be published at each corresponding time to reveal the relevant trapdoors, resulting in a highly efficient and feasible scheme. Our scheme is the first of its kind to combine time and attribute factors for access control in cloud storage, while simultaneously achieving fine granularity and timed release features. To realize this scheme, we have designed an effective architecture that involves redefining the role of the central authority (CA) to handle the timed-release function. The CA is responsible for distributing attribute-associated private keys and periodically publishing universal time-related tokens to release access privileges. This architecture incurs only a small cost, making it a reasonable, actionable and worthwhile solution.

II. LITERATURE REVIEW

The field of cloud computing has been rapidly evolving in recent years, with the advent of advanced technologies that have enabled a variety of applications and services to be hosted in the cloud. As more data is stored in the cloud, there is a growing need for robust security mechanisms to ensure that sensitive data is protected from unauthorized access. One key area of concern is access control, which plays a critical role in ensuring that data can only be accessed by authorized users.

In recent years, there has been a growing interest in the development of advanced content accessibility controllers that can provide fine-grained access control over cloud-based content. These systems are designed to provide greater flexibility and control over data access, while at the same time minimizing the risk of data breaches and other security threats. The following is a review of the key research papers and studies in this field.

In a paper published in 2016, Zhang et al. proposed a novel access control system that utilizes a hierarchical attribute-based encryption (HABE) scheme to enable fine-grained access control over cloud data. The system is designed to support dynamic updates to access policies, which enables data owners to modify access permissions on the fly. The authors also propose a novel scheme for enforcing time-based access policies, which enables data owners to control when and how data can be accessed.

In another paper published in 2018, Chen et al. proposed a novel content access control system that utilizes blockchain technology to provide secure and tamper-proof access control for cloud data. The system is designed to provide fine-grained access control over data, while at the same time ensuring that access policies are enforced in a secure and transparent manner. The authors also propose a novel scheme for dynamic access control, which enables data owners to modify access policies in real-time.

In a study published in 2019, Li et al. proposed a novel access control system that utilizes a hybrid approach combining attribute-based encryption (ABE) and blockchain technology to provide secure and flexible access control over cloud data. The system is designed to provide fine-grained access control over data, while at the same time ensuring that access policies are enforced in a secure and transparent manner. The authors also propose a novel scheme for time-based access control, which enables data owners to control when and how data can be accessed based on predefined time intervals.

In conclusion, the development of advanced content accessibility controllers has become a critical area of research in the field of cloud computing. With the increasing demand for fine-grained access control over cloud data, it is clear that new and innovative access control schemes will continue to be developed in the years to come. The above-mentioned research papers demonstrate that attribute-based encryption, blockchain technology, and hybrid approaches can be effective in providing secure and flexible access control over cloud data.

III. METHODOLOGY

In the realm of public cloud storage, ensuring data privacy and security is crucial for data owners. It is imperative that they have complete control over their data, protecting it from unauthorized and untimely access. Time sensitivity also poses a significant challenge in dealing with data, such as the need to publish the latest electronic magazine or exposing a company's future business plan. When uploading time-sensitive data to the cloud, data owners may require different users to access content at different times. While numerous works have proposed fine-grained data access control to safeguard data confidentiality against malicious access, no efficient schemes have yet provided fine-grained access control along with the capability of publishing time-sensitive data. The work presents an effective access control scheme that combines time and attribute factors to secure time-sensitive data stored in public cloud environments.

The proposed scheme offers two key features viz:

a)It incorporates the fine-grained data access control property of CP-ABE.

b)The introduction of the trapdoor mechanism enables our scheme to provide timed-release functionality, similar to TRE.

It is worth noting that the trapdoor mechanism is exclusively linked to the time factor, and only one secret needs to be disclosed to reveal the associated trapdoors. As a result, our scheme is highly efficient and adds little overhead to the original CP-ABE based system. It also addresses the issue of designing an efficient access structure for arbitrary access privilege construction with both time and attribute factors, particularly when multiple access privilege release time points are embedded in an access policy. It also propose various sub-policies for time-sensitive data and present an efficient and practical approach for constructing the relevant access structures.

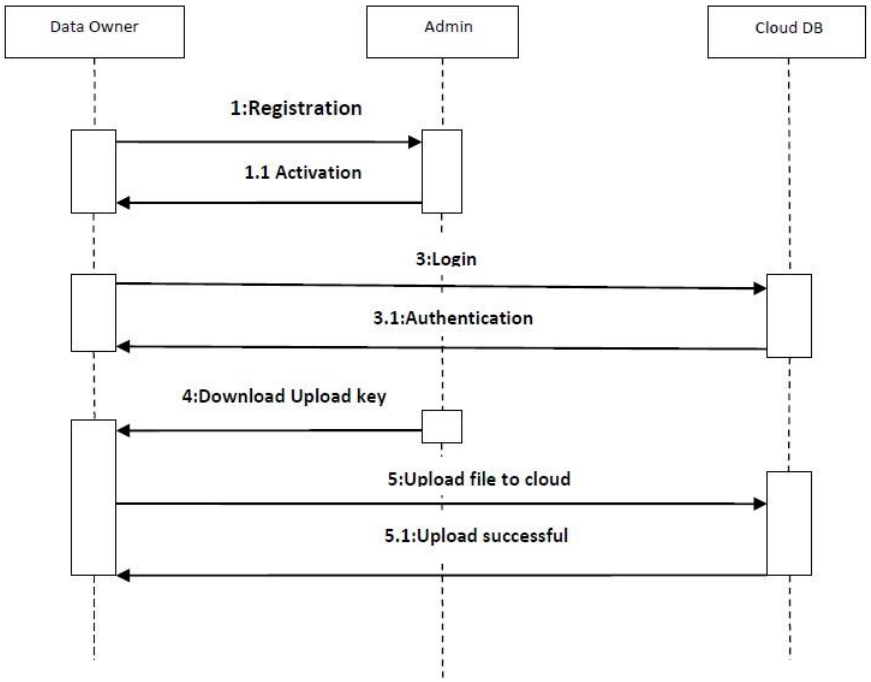
The architecture consists of four modules viz:

1. Data Owner
2. Search User
3. Cloud Service Provider (ADMIN)
4. CA

In Data owner module, there are n numbers of data owner are present. Owner should register before doing some operations. And register Owner details are stored in Owner module. After registration successful he has to login by using authorized user name and password. Data Owner, based on the characteristics of users to develop different access control strategy, encrypt uploaded files using the corresponding encryption method and then send to the cloud server.
The Registration module consist of following five fields:

Register: Registration is the process of creating a new account within a system. It typically involves providing some basic personal information, such as a username, email address, and password, which are then used to uniquely identify and authenticate the user. In addition to basic account information, registration may also involve agreeing to terms and conditions, providing additional contact information, and setting preferences or customization options.

Figure 1 Sequence diagram of the proposed architecture



Login: Login is the process of accessing an existing account within a system. It requires the user to provide their previously established username and password to verify their identity and authenticate their access to the system. Once authenticated, the user is granted access to their account and any associated data or functionality.

Upload File: Uploading a file involves selecting a file from the user's local device and transferring it to a remote server or storage location. This typically involves specifying the file to be uploaded, selecting a destination folder or location, and initiating the transfer process. During the transfer, the user may be presented with progress indicators or other feedback to indicate the status of the upload.

View File: Viewing a file involves accessing and displaying the contents of a file within a system. Depending on the file type and system capabilities, this may involve rendering text, images, audio, or video, or providing access to interactive features such as forms or data visualizations. Viewing may also involve navigating within or among multiple files, adjusting settings or preferences, or interacting with related functionality such as annotations or commenting.

Logout: Logging out of a system involves terminating an authenticated session and deactivating any associated user credentials. This is typically achieved by selecting a "logout" or "sign out" button or link within the system, which triggers a process to invalidate the user's session token or other authentication information. Once logged out, the user's access to the system and any associated data or functionality is terminated until they authenticate again with valid credentials.

The Search User module consists of five fields:

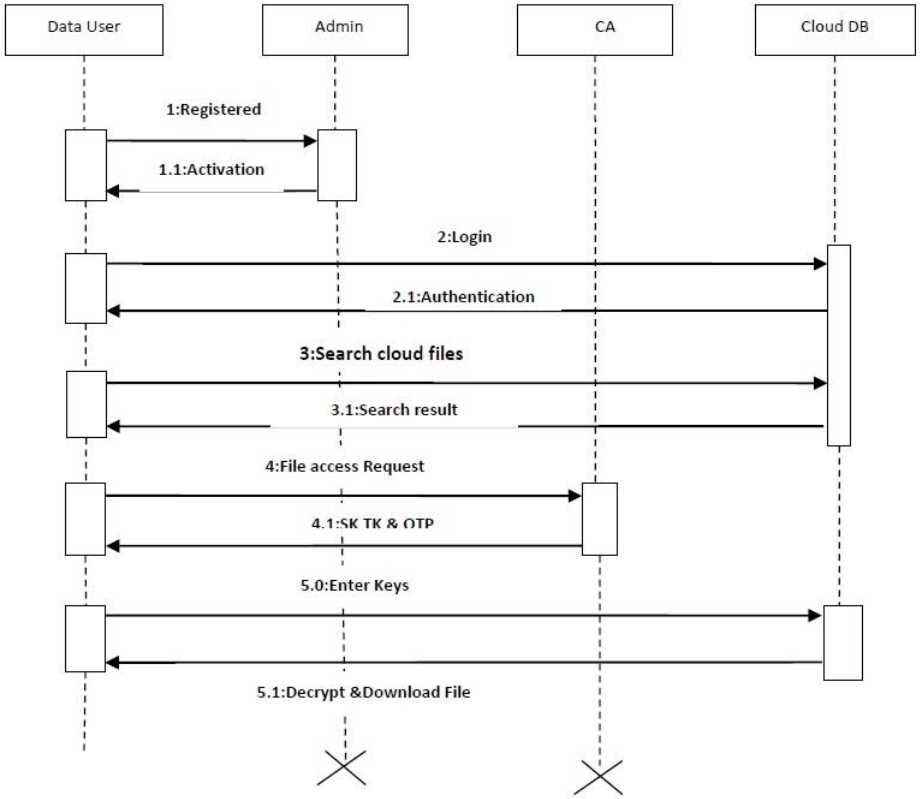
Register: This field typically involves creating a new user account on the system. Users may be required to provide personal information such as their name, email address, and password to complete the registration process. The system may also include features such as email verification or CAPTCHA to ensure that the registration is being performed by a human user and not an automated script or bot.

Login: Once registered, users can log in to the system using their username and password. The login process involves verifying the user's credentials against those stored in the system's database. The system may also include features such as two-factor authentication or account recovery options to provide additional security and account recovery options.

Search File: This field allows users to search for files based on various criteria such as file name, file type, or keywords in the file's content. The search functionality may use algorithms such as fuzzy matching or advanced search operators to help users find the files they need quickly and easily.

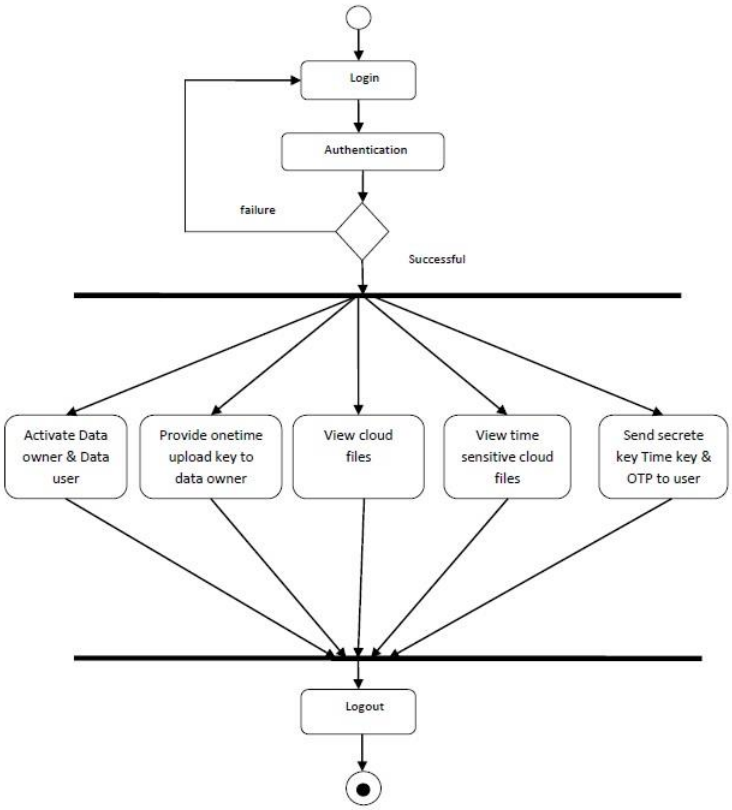
Request File: Users can use this field to request access to files that they do not have permission to access. Depending on the system's access control policies, users may be required to provide a justification for the request or be granted access automatically based on their role or other criteria.

Figure 2 Data Flow Diagram of the proposed architecture



Download: This field allows users to download files that they have permission to access. The system may include features such as file versioning or access logging to track who has downloaded a file and when. Download functionality may also be subject to access control policies, such as limiting the number of downloads or imposing restrictions on the types of files that can be downloaded.

FIGURE 3 Activity diagram of the proposed architecture



IV. RESULTS AND DISCUSSION

The architecture has the inherent advantages as the system ensures secure communication between the cloud server and the user. The architecture will be able to operate on any platform without requiring recompilation. The system is reliable and will maintain its performance without degrading the existing system or causing it to crash. The system is capable of performing optimally even with a significant increase in the number of users. It provides an application which is fault-tolerant with regards to illegal user or receiver inputs, and the system can be enhanced to contain error-checking mechanisms to prevent system failures. In this paper descriptive statics are implemented by using timed-release encryption using CP-ABE. The work also involves the development of an access policy structure for fine-grained data access control. The work also addresses the potential risk of collusion attacks. Lastly it eliminates the need for secure channels during key distribution to improve performance.

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